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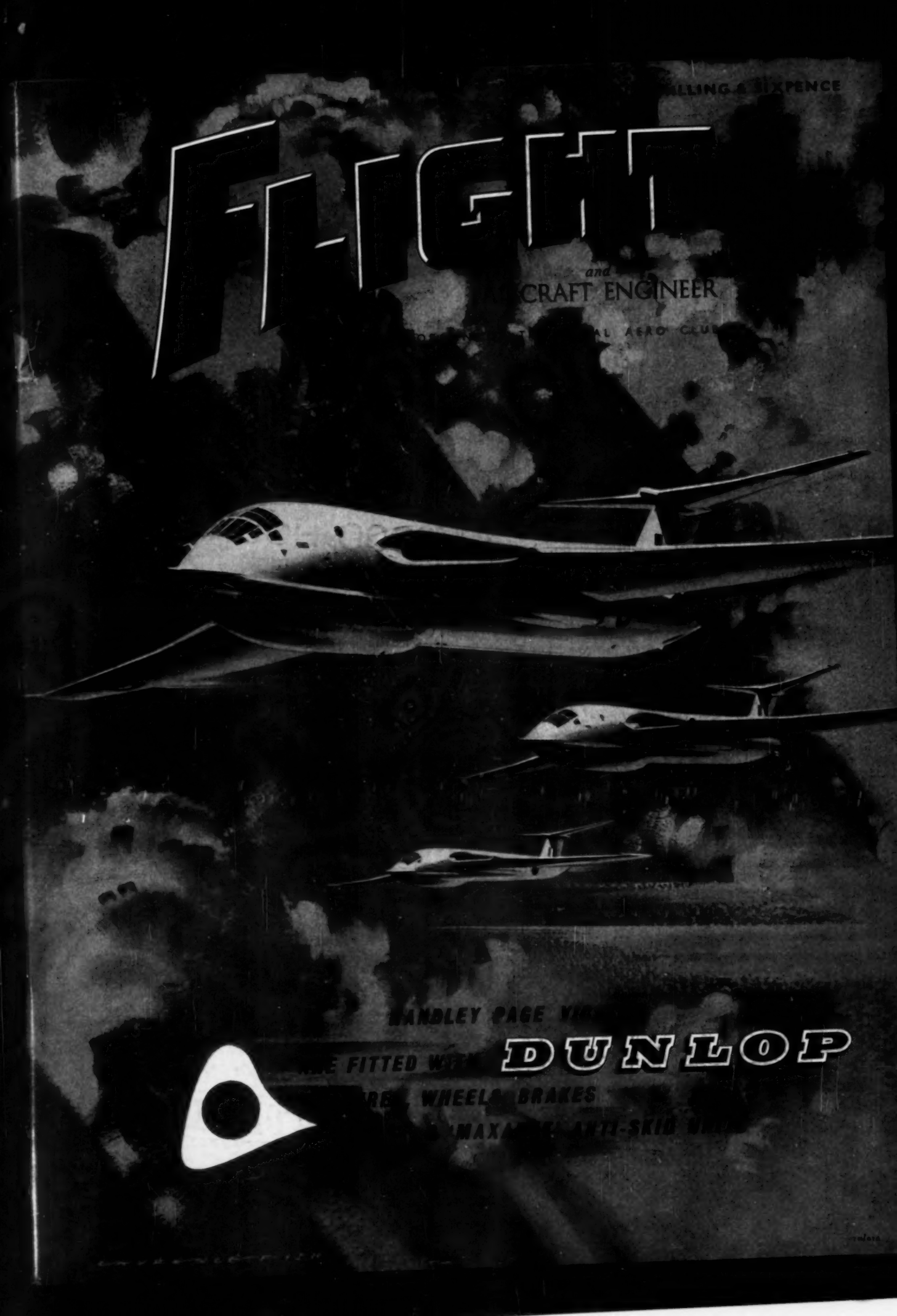

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10000 HOURS

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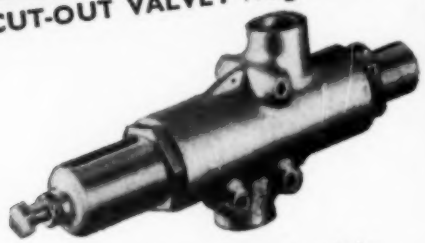
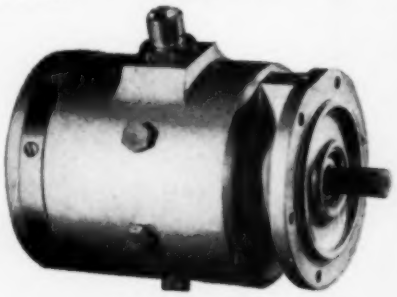


Proposed period between overhauls by B.O.A.C. for the Comet 2E — 10000 hours

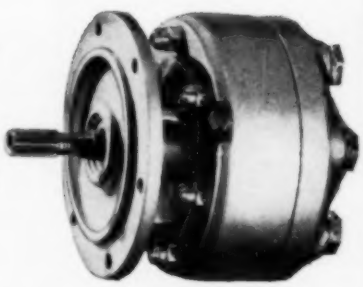
10000 HOURS

MARK 8 ENGINE-DRIVEN PUMP
Weight 16 lb. 2 oz.
Proposed period between overhauls by B.O.A.C. for the Comet 2E — 5000 hours



5000 HOURS

MARK 9 ENGINE-DRIVEN PUMP
Weight 7¼ lb.
Approved period between overhauls by the Air Registration Board for the Vickers 'Viscount' — 6000 hours



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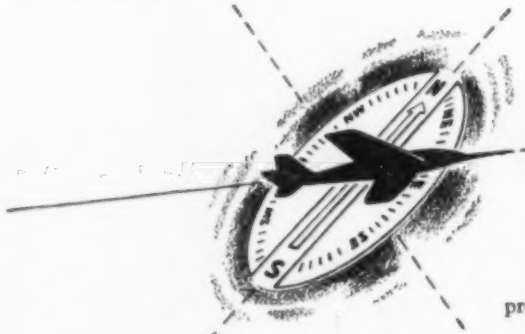

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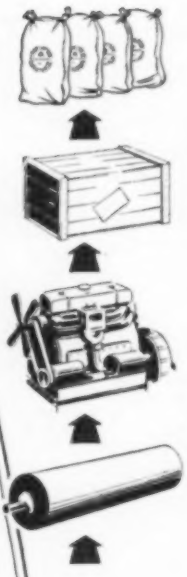

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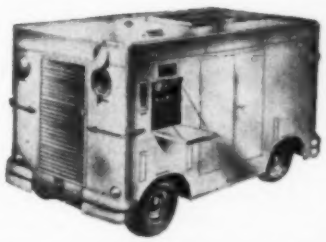

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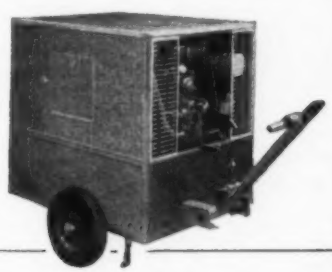

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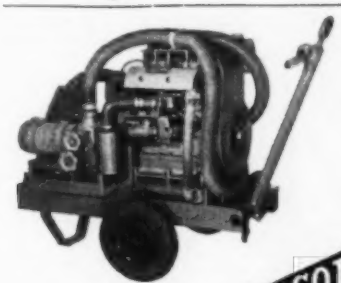

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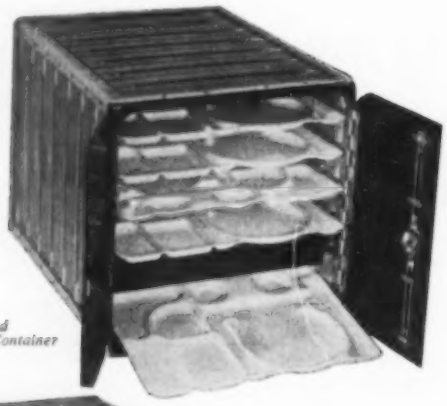

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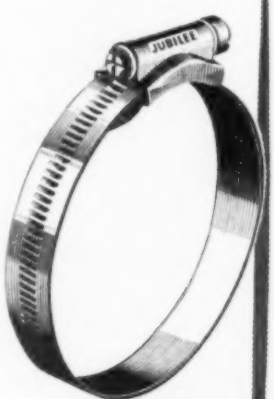

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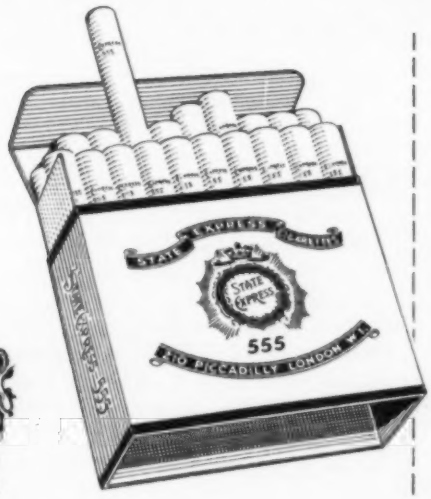

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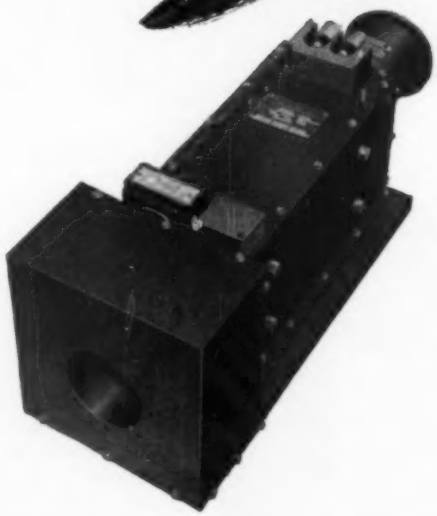

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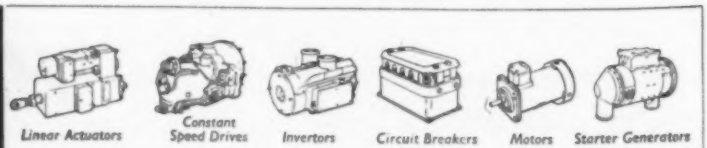

AE24

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FLIGHT
and
AIRCRAFT ENGINEER

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Gliding Angles

FLYING for fun is no easy task these days. There are, for instance, the dangers of navigation through miles of uncharted regulations—officialdom's built-in I.M.C., so to speak—before eventually reaching the free airspace remaining over this country. Among those who do fly for fun, however, none deserve admiration more than those who do so without engines.

Britain's gliding movement has progressed steadily during the ten years since the first post-war National Championships. We may recall the successes of Philip Wills, who became world champion in 1952, and of Nicholas Goodhart and Frank Foster, who became world two-seater champions last year—and also the increasing efficiency and world-wide popularity of British-built sailplanes. And now a further notable step is to be taken with the opening, by the Duke of Edinburgh at Lasham in nine days' time, of the largest-ever gliding championship meeting.

Gliding is indeed the best example of "do-it-yourself" flying. It demands enthusiasm and hard work—not merely the inclination to telephone the club and book an aircraft for 10.30. It gives in return an unfair amount of frustration in the early days, followed by the silent freedom, adventure and satisfaction that only sailplane pilots know.

For many years this country's gliding movement has enjoyed a certain amount of freedom from official regulations. The movement has justly been trusted to organize its own affairs in such matters as airworthiness and site operations. But the twin dangers of controlled airspace and insecurity of tenure are now raising basic difficulties—where to glide from and, once airborne, where to glide.

In this week's special articles concerned with soaring flight—which appear as a gentle contrast to our exclusive report on the supersonic P.1 fighter—impressions are given of the background and achievement of British gliding. For those who would learn more we suggest a visit to the National Gliding Championships at Lasham, where some 300 pilots are working on the ground that 130 may compete in the air. Especially do we suggest this to those Ministry officials who, having kept Lasham Gliding Centre dangling on a one-month security string for so long, are now toying with quite unrealistic rents for longer-term tenure.

To the British Gliding Association and the Surrey group of clubs at Lasham we wish sparkling good weather and the most successful championships yet.

Economy in Effort

CHANGING the shape of the R.A.F. means not only fewer types of aircraft and a continually increasing emphasis on guided weapons but a smaller body of men with which to carry out our air commitments both here and overseas. This involves some re-tailoring to new patterns and a good deal of new thinking about old (and often cherished) traditions. Can a squadron be just as efficient if its personnel is cut by a quarter? Can a station's paper battle be won by two-thirds the number of clerks? Can time-honoured procedures be hastened so that less time is lost and each man's energy is fully deployed?

According to A.V-M. W. L. Freebody, the Air Ministry's Director of Work Study, the answer is an affirmative one in each case. Last week, when he reported on the first six months' application of work-study methods to the R.A.F., A.V-M. Freebody quoted some encouraging results. Canberra squadron performance had been improved with a 20 per cent reduction in personnel (and although, for security reasons, nothing could be said about a similar study of V-force operation, the implication is encouraging); Hunters had been refuelled and rearmed more quickly with six men instead of ten; and paper-pushing manpower has been reduced because the R.A.F.—to use the air vice-marshal's own words—is becoming more businesslike.

It seems clear that in such matters the R.A.F. is matching the challenge it faces in the adoption of new weapons; it is slimming off the fat and flexing its muscle and sinew. Prosaic though the science of work-study sounds, it is obviously playing an important part in enabling a reduced fighting Service to meet all demands; and if such good results have been achieved in only six months, portents for future successes in this field look bright indeed.

HONOURABLE RETIREMENT: In this line-up of old and new at Biggin Hill are the three Spitfires flown in there last week by G/C.s J. E. Johnson and J. Rankin and W/C. P. D. Thompson; they will be kept serviceable, with the historic Hurricane (extreme left) for Battle of Britain and other fly-posts. At the far end of the line are some of Fighter Command's present equipment, Hunters of No. 41 Sqn. and Javelins of No. 46.

FROM ALL QUARTERS

Snark in, Navaho Out

A CONTRACT valued at $73m has been awarded to Northrop Aircraft for quantity production of the Snark SM-62 inter-continental missile. Deliveries are likely to begin in the second half of the fiscal year 1958, and Northrop have assigned nearly 8,000 employees to the project.

It was announced in Washington last week that work on the North American Navaho intercontinental missile has been cancelled. Mr. James Douglas, Secretary of the Air Force, gave "a limited budget" as the reason.

New Hawker Siddeley Directors

TWO new directors have been elected to the Board of the Hawker Siddeley Group: they are Mr. H. G. Herrington, C.B.E., F.R.Ae.S., and Mr. G. C. R. Eley, C.B.E. This news comes as we go to press; further details will be given next week.

Widgeons for Brazil

AN order for two Widgeons, with spares and special equipment, has been placed by the Government of Brazil with Westland Aircraft, Ltd. This is the first export order to have been obtained for the Widgeon, and the aircraft—intended for use by the Brazilian Navy for rescue, communications and general duties—are the first helicopters to be ordered by Brazil from Britain.

Navaid Developments

THE Jet Operations Requirements Panel, meeting recently in Montreal, has stated categorically (after considering all available types of navigation aid) a requirement for "an accurate and reliable short-range navigational aid based on the area-coverage system and designed to provide pictorial presentation to the pilot in the cockpit." It has also recommended that the forthcoming sixth session of the Communications Division should consider this recommendation "as a matter of urgency."

The Decca Navigator, more than any other operational system, fulfils this requirement; and it has been in use for some years.

For the long-range navigation system, Dectra is at present being evaluated and is giving very good results. It has a number of features which make it attractive for this type of coverage. The Doppler equipment, described in *Flight* last week, has a particular advantage where ground-based aids are lacking, but it cannot by itself provide the complete navigation service—nor is it claimed that it should. Incidentally, the weight of the complete Marconi AD.2100 was quoted in error as 70 lb instead of 170 lb.

The inherent weaknesses of Doppler make it desirable that it should be combined with a system like Decca/Dectra; and such a combination is at present being developed by the Decca Navigator Company.

Swedish Vertol Order

AN order for four Vertol helicopters—specified by the company designation Model 44—has been announced by the Commander-in-Chief of the Swedish Navy. This follows a year's study of different types by the Swedish helicopter committee.

The Hustler's Speed

SPEAKING at Fort Worth, Texas, last week, Mr. Frank Davis (chief engineer of Convair's Fort Worth Division of General Dynamics) quoted the B-58 Hustler as having achieved 1,290 m.p.h., "though its maximum speed is not known."

The same occasion brought a rather surprising statement from Lt-Gen. Irvine, U.S.A.F. Deputy C-in-C. for Materiel. "I'm convinced," he is quoted as saying, "that the B-58 is the fastest jet plane in the world. I know we don't have one to match its speed, and from what I've read and seen I'm sure the Russians don't either."

F.A.I. Sports-flying Proposals

WHEN the Fédération Aéronautique Internationale held its 50th general conference last month, delegates from 25 countries assembled at Palermo to take part. Three days were spent in business and one of the subjects discussed was the organization—which the F.A.I. has had under consideration for some time past—of "gatherings of sport" once every four years. As yet, no complete answer has been found to the difficulties involved; but the Aeronautical Union of Yugoslavia and the Aéro-Club de France intend to organize extensive air tours, one in south-east Europe and the other in the west and north-west.

The tours would be divided into two parts—one for professional pilots and for aircraft entered by manufacturers, the other for private pilots with their own aeroplanes. During the former there will be no limits on speed, so that manufacturers will be able to show off the paces of their aircraft; the latter will be for *bona fide* pilots and owners flying for pleasure and not wishing to drive their machines too hard.

It is possible that France or Yugoslavia (or other countries) would organize extra air events round about the same time, so gradually building up towards the original idea of a big sports-flying gathering once every four years.

When the F.A.I. election of officers was held, Gen. Charles Sillevaerts (Belgium) was re-elected president, Miss Jacqueline Cochran (U.S.A.) first vice-president, and M. Jean Blériot (France) treasurer-general. Members of the Board for 1957-8 are M. Jacques Allez (France); Dr. W. Muri (Switzerland); Mr. C. Kolff (Holland); Capt. K. J. G. Bartlett (G.B.); Sr. José M. M. y Coll (Spain); Mr. S. Staritchevski (U.S.S.R.); and Mr. S. Sakota (Yugoslavia).

SMOKING ARROW: The five Hunters of No. 111 Sqn. aerobatic team (at the recent Milan display) stream twin trails of smoke as they arch over a loop preparatory to the bomb-burst evolution. A formation change is traced by the smoke further back. Italian, French, Turkish, Greek and Spanish teams also performed.

TWO DAYS AT THE RACES

—for Aerobatics, an Air Display, the King's Cup and the Air Racing Championship

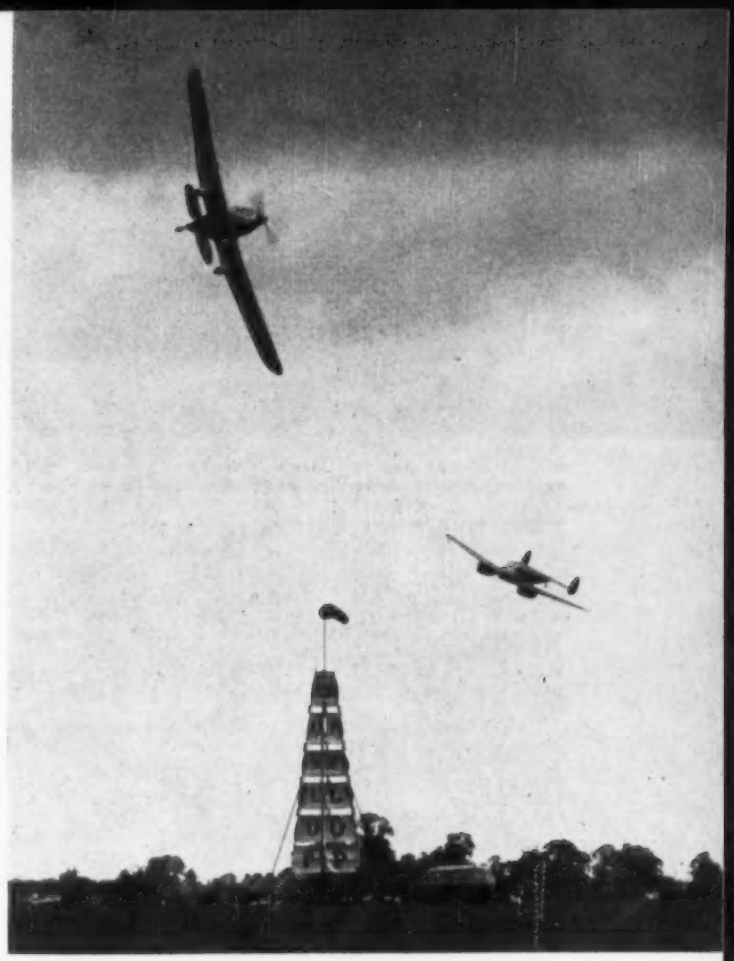
"FLIGHT" PHOTOGRAPHS

THE crowds that make an annual pilgrimage to Baginton to watch air racing might be forgiven for thinking that Coventry's municipal aerodrome remains *en fête* the whole year round. The marquees, the loudspeakers, the enclosures, the aircraft—even the weather—were familiar from last year; twelve months, it seemed, had been compressed into nothing and the 1957 Air Racing Championship was a hardly-interrupted continuation of the event the year before.

A false first impression. There were new faces and new challengers for the racing cups, a new one-type race, a new and impressive international entry for the aerobatic competition and—as it turned out—one of the best flying displays ever seen in the Midlands, with no fewer than five formation aerobatic teams taking part. That the air racing season should be sandwiched into two days was to be regretted, but for one crowded weekend at least there was a sufficiently ample feast to satisfy the most rabid air racing enthusiast. The handicappers were not slow to seize this golden opportunity, and in the second round of the Goodyear Trophy they succeeded in producing what was claimed to be the first dead heat in British air racing history.

Damp, blustery weather (but with good visibility) faced the competitors on Friday for the first and second rounds of the Osram Trophy, the Kemsley Trophy, the Goodyear Trophy and the *News Chronicle* Trophy. The last-named, a new "one-type" event for Tiger Moths, was very well supported. First man away in this brief racing season of 1957 was Bill Bailey, flying a Hawk Trainer from Elstree Aero Club in the first round of the Osram Trophy. The field streamed away to the scatter-point, turned steeply down towards the Bubbenhall marker, and the 1957 International Air Races had begun. The succeeding races followed quickly; by lunch-time the first rounds had been flown off and anomalies in the handicapping could be corrected before the second innings began in the afternoon. New types tend to suffer heavily from the handicappers, and both the Thruxton Jackaroos (making their public debut) had been fairly harshly treated in relation to some of the more race-modified types against which they competed.

The racing in the afternoon was consequently rather closer than in the morning. Knox, Paine and Barker started a Proctor battle that continued throughout the following day and Dunkerley's Sparrowjet began to show its real form—although around four laps of the ten-mile circuit it was slower than the Mew Gull. And the second round of the Goodyear Trophy, when Bowles (Miles Monarch) and Denyer (Auster J.1N) tied for first place, produced one of the best race finishes ever seen. There were occasional



Bailey's Hawk Trainer 3 leads Blamire's Gemini 1A around the Aerodrome pylon in the Osram Cup.

troubles; Appleyard's Chilton broke its tailskid and was forced to taxi tail-high until assistance arrived; and Rush lost a spinner at the start of the Kemsley Trophy. Dunkerley also suffered a spell of bad luck in the morning when he was unable to start one engine of his Gemini in sufficient time; and later when he inadvertently turned inside a pylon and was automatically disqualified.

Following the racing came the eliminating rounds of the Lockheed Aerobatic Trophy. Seventeen competitors were each allowed a total of about ten minutes—nearly three hours of solo displays and a stern physical task for the judges on that cold, damp evening.

Saturday's Racing. Saturday dawned grey and overcast, with the same blustery wind that had caused bumpy conditions the day before. Lighter patches of sky behind wispy fracto-stratus

Kemsley Trophy competitors in this line-up include Ron Paine's Hawk Speed 6, Rush's Falcon 6 (less spinner), Marler's Falcon 6, Crabtree's Gemini and Barker's Proctor. Laurel-wreathed Fred Dunkerley (right) carried off the rewards accorded to the King's Cup winner who makes the best average speed in both that race and the Osram Cup.

With Col. Preston (Secretary-General of the R.Ae.C.) assisting, the Lord Mayor of Coventry presented awards to F/L. H. B. Iles (Championship, and Osram Cup), A. Barker (Kemsley Trophy), W. P. Bowles (Goodyear Trophy) and P. Clifford (Norton Griffiths Trophy, in the Kemsley race).

TWO DAYS AT THE RACES . . .

betokened sunlight not so far away, but little enough reached Coventry during the day. Leading the Championship as a result of Friday's rounds were Iles (M.18) and Barker (Proctor 3) with 44 points each, followed by Bowles with 43 and Appleyard with 42. This year the King's Cup did not count for the Championship, except to decide ties, and a win for Iles in the Osram Trophy would make him Air Racing Champion for the second successive year.

Prompt to time, off went Bailey as limit man in the Osram Cup for the third time, followed a long while afterwards—nearly half a lap—by Iles. He stayed at grass-top height while into wind and climbed only for the scatter-point turn, continued climbing cross-wind and maintained his altitude on the 6,950-yd down-wind leg. Gaining the maximum benefit from the wind and making really precise turns is part of Iles' technique. Scratch man Dunkerley, apparently so far behind that it was suggested he was leading the next race (for which he was also entered) began to bring his Cirrus Minor Gemini through very fast in the last lap, but he could not quite catch Iles, Blamire or McIntosh, who finished in a very close bunch. And so Iles—whose lap times remained remarkably consistent in each race—became Air Racing Champion again.

Blamire, diving very low in the turbulent air near the finishing line, abbreviated a propeller against the ground and slightly damaged the fuselage and a cowling. But he landed safely, arranged for a new propeller to be flown out to Baginton, and by some heroic work was ready for the King's Cup in the afternoon.

The next race, and the third round of the Sparrowjet *v.* Mew Gull duel was the Kemsley Challenge Trophy, and for a few brief minutes the sun came out to add a welcome sparkle to the scene. Only one competitor—Crabtree (Gipsy Major Gemini 3a)—managed to pull out additional speed, and his unusual tactics of flying low to overtake on the *down-wind* leg were rewarded; he crossed the finishing line five seconds ahead of Buster Paine's Red Proctor 1, which on the last lap had in turn fought off close opposition from Knox and Barker. The Sparrowjet went no faster than before (it averaged 196 m.p.h.) but it quite unexpectedly reduced the time for its standing lap by ten seconds, and so pipped the Mew Gull—throaty-voiced favourite of many—by the same amount.

First away in the Goodyear Trophy final were the two air racing newcomers, the Jackaroos of Heaton (canopied) and Cdr. W. Stuart (crop-sprayer); Hill decided to reserve the Tipsy B for the King's Cup. Last men off were Denyer in the Auster J.1N and Bowles, his dead-heat rival of the day before, 36 seconds behind him in the cream and red Monarch. By the end of the first lap a third biplane had joined the leading Jackaroos, and at the aerodrome pylon Meynell slipped his Tiger Moth neatly ahead to build up a clear lead by the Bubbenhall turn. Next round the aerodrome pylon was Ogilvy, Maggie-mounted, but quite unmistakable with his Comper Swift technique of a rapid, maximum rate turn on to the next heading. But perhaps his reputation frightened the handicappers; the Magister was never really in the picture.

Soon the Jackaroos had been gobbled up by a Monarch as well as by Tigers. Gregory and Denyer were also up near the front. As they approached the finishing line, Bowles pulled comfortably ahead, pursued by Denyer, Hartas in the glazed front cockpit "Taxi Tiger," and Gregory. Hartas had an Awful Moment crossing the line and flew overhead blipping his throttle, obviously worried about his undercarriage. There was then a short fire-engine race, but all was well and Hartas landed safely.

Last of the Championship events was the *News Chronicle* Trophy for Tiger Moths—many of the contestants old adversaries of Tiger Club races. The start was spread out over 1 min 29 secs, measure of the difference in performance of the Tigers over three laps of the ten-mile course. Last away was Arch-Tiger-Tim Norman Jones. By the end of the first lap, the leading four were well bunched and soon the whole field was concentrated on two legs of the course. As they approached the finishing line they appeared to be suspended against the vigorous cloudscape; then, in a tight, low finish, Jones, Vanneck, Pothecary, Donald, Phillips and Oldham roared across the line. An exciting conclusion to the class racing.

This year was the 25th time that the King's Cup has been contested and a 112-mile cross-country course Baginton-Sywell-Peterborough and back was chosen for the occasion. To qualify, each competitor had been required to complete at least one round of the preceding class races. While the afternoon's air display got under way the eligible 36 faced the starter's flag. The visibility remained sharp and clear.

Spread over 40 minutes, the start was undramatic. First away was Hill in the Tipsy B, followed again by the Jackaroos of Heaton and Stuart. Harris and Pothecary, both in yellow Tiger Moths, set off together, but Harris cleared the scatter-point first as the two Tigers climbed well away to gain maximum benefit from the tail-wind conponent on the leg to Sywell. Pothecary later managed to overhaul Harris out on the course. Bailey and Ogilvy went off together in similar Hawk Trainers, but Bailey immediately began to pull away. Overhead, the E.P.9 interrupted its demonstration while Bowles and Denyer went off, the latter initially off course. Maestro Iles, the same as ever, climbed the M.18 only at the first turn; he was followed a long while after by Johnston's spatted, canopied, fast Hawk Trainer. And so through the field until—with a characteristic 23,300 r.p.m. scream of its Turboméca Palas, Dunkerley's Sparrowjet left the line followed in its pursuit of the leaders by the Mew Gull. The display continued and the tea tents gradually filled. . . .

Then, little more than half an hour later, while all eyes were on the demonstration of a Whirlwind Helicopter, came the sudden characteristic whine of two baby jets from the west, and the slim white Sparrowjet, so persistently entered and flown by Dunkerley, flashed across the finishing line more than two minutes ahead of the rest of the field to win the King's Cup by a handsome margin. Never before has the Sparrowjet gone so well and never before has the premier British air race been won by a jet. It averaged 228 m.p.h. to the Mew Gull's 215 and amply justified its long development. After Dunkerley came a terrific finish; Rush's Falcon, Bowles' Monarch, Clifford's Mew Gull were all covered by eight seconds and then the rest of the big field deluged the finishing line in their final place-grasping dive. It was an enthralling finish, and all too quick an end to the 1957 air racing season.

The Aerobatic Competition. In its third year, the British Lockheed International Aerobatic Competition drew 17 competitors from eight countries. An eighteenth entry, the Somers

Fred Dunkerley's Sparrowjet—King's Cup winner and fastest entrant.

On its first major public appearance, the four-seat Jackaroo (left) was flown in the Goodyear and King's Cup races. (Centre) Aresti's Jungmeister in a very low inverted fly-past. (Right) The C.F.S. Provost aerobatic team in typically immaculate box formation.

Kendall SK-1, was scratched at the last moment because of an engine failure. During a three-hour session on Friday evening each competitor spent ten minutes in the air, five of them demonstrating, and six pilots were chosen to go forward to the finals the next afternoon. The final winner was the Czech pilot V. Krysta, in an Akrobat, Léon Biancotto (Stampe SR-7), last year's winner, coming second. None of the six British pilots made the final.

The aircraft were divided into two groups, with maximum weights above and below 3,858 lb. Actually, only the Spitfire Trainer, flown by Israeli H. Marom, was in the heavier category; and its pilot therefore automatically won the £50 prize for the best pre-final performance in this weight class. Each pilot could gain a total of 100 points, 25 each for scope, accuracy, artistry and positioning, and originality. The six finalists won prizes respectively of £300, £250, £200, £150, £100 and £50, the winner also receiving the silver trophy and a replica, all by the generosity of the Lockheed Hydraulic Brake Company. Each pilot had to include in his repertoire a slow roll from level flight, an inside loop and a half roll off an inside loop. He was allowed four minutes to position himself and green and white Very lights respectively marked the start and finish of each five-minute demonstration. If the pilot exceeded his time, showed bad airmanship, or came below 328ft, he lost marks.

In the event, the timing went very well in both heats and no one exceeded his allowance, though some were caught in the middle of a final manœuvre. The strong wind troubled most competitors. The judges' panel consisted of Maj. Oliver Stewart (chief judge), Capt. H. S. Broad, Lt-Cdr. Jeffrey Quill, S/L. C. K. Turner-Hughes, Geoffrey Tyson and A.Cdre. A. H. Wheeler—as good a gathering of pilots and connoisseurs as one could wish for. The competitors, in order of flying in the eliminating heat, were:—

D. W. Phillips (Tiger Moth, U.K.), J. Ederer (Jungmeister, Germany), F. S. Symondson (Tiger Moth, U.K.), J. Blaha (Akrobat, entered by Czech Aero Club), A. Jannssens (Stampe SV-4, Royal Belgian Air Force), L. Biancotto (Stampe SR-7, France), P. J. Langstone (Tiger Moth, U.K.), H. Marom (Spitfire Trainer, Israel), K. Krenc (Akrobat, Czech Aero Club), Le Chevalier d'Orgeix (Stampe SV-4, France), C. Nepean Bishop (Tiger Moth, U.K.), V. Krysta (Akrobat, Czech Aero Club), C. Boddington (Tiger Moth, U.K.), M. Prikryl (Akrobat, Czech Aero Club), J. L. Aresti (Jungmeister, Spain), Maj. F. Liardon (Jungmeister, Switzerland) and D. M. Hartas (Tiger Moth, U.K.).

The eliminating heat showed one thing clearly—namely, that the Tiger, even with the inverted carburetter and regardless of the pilot's skill, lacks the necessary urge and performance to compete with specially-built aerobatic machines like the Jungmeister and Akrobat. The Stampe, too, out-performs it very comfortably. The smallness of the Jungmeister, which makes it a superb aircraft for flick manœuvres, admittedly detracts from its presentability. Both Ederer and Liardon put up very fine performances in this type, but Aresti was the only one to fly it in the finals. Jannssens was very good in his Stampe, but d'Orgeix flew his in the finals. On Friday evening Biancotto was so smooth in his Stampe SR-7 monoplane that we feared for him in the face of the whirling and roaring Czechs; but he sailed most gracefully into second place (he won last year) with a superb demonstration.

The Czechs were obviously destined for the finals from the start. Though the Akrobat is a rather ugly aircraft, it has plenty of power and direct injection makes long inverted flights possible. We thought Krenc would make the finals rather than Blaha.

The finalists were in fact Aresti (Jungmeister), Biancotto (Stampe SR-7), Blaha (Akrobat), d'Orgeix (Stampe SV-4), Krysta (Akrobat) and Prikryl (Akrobat) flying in that order. In describing their evolutions one is considerably cramped by a lack of terminology to fit many of the complex variations on standard aerobatic themes. Biancotto took the difficult first performnce and concentrated mainly on vertical manœuvres. His placing and sequence were excellent; he made several inverted figures of eight and ended with the prettiest rolling 360-deg turn we have seen. Positioning and smoothness were his great qualities.

D'Orgeix spun finely off a stall turn, flicked and performed a very slow roll indeed. He also executed an eight-point roll and made a rolling 360-deg turn. Blaha, who followed, seemed to suffer a little from a hesitant engine, but made a fine flick from a 45-deg bank to one side into a 45-deg bank to the other. He also displayed a vertical eight, outside loops with rolls interspersed, and a good eight-point roll. He was just caught by the white Very. Aresti, flying fourth, started with an inverted spin well upwind, and included a tail slide (the only one), several flick rolls, a four- and an eight-point roll and a rolling 360 deg turn.

Krysta, the eventual winner, was undoubtedly the most varied and original with outside and inside vertical and horizontal figure eights laced with flick and fast rolls. He also made two turns of an inverted spin off a backward hammer stall. Prikryl was a little too close overhead and perhaps too repetitive with his rolls during loops. He alone made two consecutive upward flick rolls and an inverted spin off an outside loop. He ended a few seconds before the Very light.

Altogether, the aerobatic contest showed what can be done, safely and skilfully, with any good aircraft. British competitors will have to try to obtain more suitable machines, and polish up on some exhibition aerobatics which, during years of practice and training, have become familiar to Continental pilots. Certainly, advanced training in aerobatics as an art is almost completely neglected in Britain while it forms a major part of advanced flying training abroad.

Final placings were Krysta, Biancotto, Orgeix, Blaha, Prikryl and Aresti. Krenc was runner-up in the light class.

(*Continued on page 96*)

V. Krysta, winner of the Lockheed aerobatic championship, and his Z.226 Akrobat single-seater—one of three flown by four Czech pilots.

HOT SCENT: A de Havilland Firestreak is discharged from an R.A.A.F. Avon-Sabre flying over the Woomera Range and (right) is seen about to strike its quarry, a radio-controlled Jindivik. Note how the weapon, which has an infra-red guidance system, is unerringly seeking the source of radiation—in this case, probably, the combined heat from the Jindivik's Viper turbojet tailpipe and the flare mounted on the tail. The photographs, which are unretouched, are enlargements from a ciné film.

HERE AND THERE

Snark Shooters

A NEW wing, to be equipped with Snark missiles, is being formed by the U.S.A.F. at Cooke A.F.B., near Lompoc, Cal.

Accumulated Energy

AT Chalgrove Aerodrome recently Mr. H. T. Taplin successfully flew a model aircraft powered by accumulators. Of 7ft 6in span and weighing 8 lb, it had a 24 v motor fed by 25 Venner H.105 silver-zinc accumulators.

Probable Record

PRODUCTION of the 45,000th Piper aircraft will be appropriately celebrated during the week of August 12. Piper say that this total of 45,000 represents the largest number of commercial [presumably "civil" is meant] aircraft built by any manufacturer in the world.

Life-saving Ladder

YESTERDAY the Gloster Aircraft Co. were due to demonstrate their newly devised stretcher ladder to Government, Service and Civil Defence representatives on a site in the City of London. Already employed by some C.D. units and industrial organizations, the device can be used for lowering a patient through small spaces or down slopes.

Marines' C-130 Evaluation

TESTS by the U.S. Marines of the Lockheed C-130 Hercules for use both as a combat and an in-flight refuelling aircraft are shortly being carried out by pilots, engineers and maintenance crews who have completed special training.

THE WORLD'S ENGINES

NEXT Friday, July 26th, the special "Aero Engines of the World" number of *Flight* will appear. Contents will include a very fully illustrated review of the notable power units built by all engine-manufacturing countries.

Academic Retirement

FROM San Diego comes news of the retirement as chairman of Solar Aircraft of Mr. Edmund T. Price, who is 62 and has now become Professor of Human Relations at California Western University. Mr. Price, who joined Solar's predecessor, the Prudden Aircraft Corporation, in 1928, will continue as a director of Solar. He became president and general manager in 1930 and chairman of the board eighteen months ago.

Presidential Pioneer

BY flying in a Bell 47J Ranger from Washington to the "Presidential relocation centre" last Friday during a U.S. civil defence exercise, President Eisenhower became the first American president to fly in a helicopter.

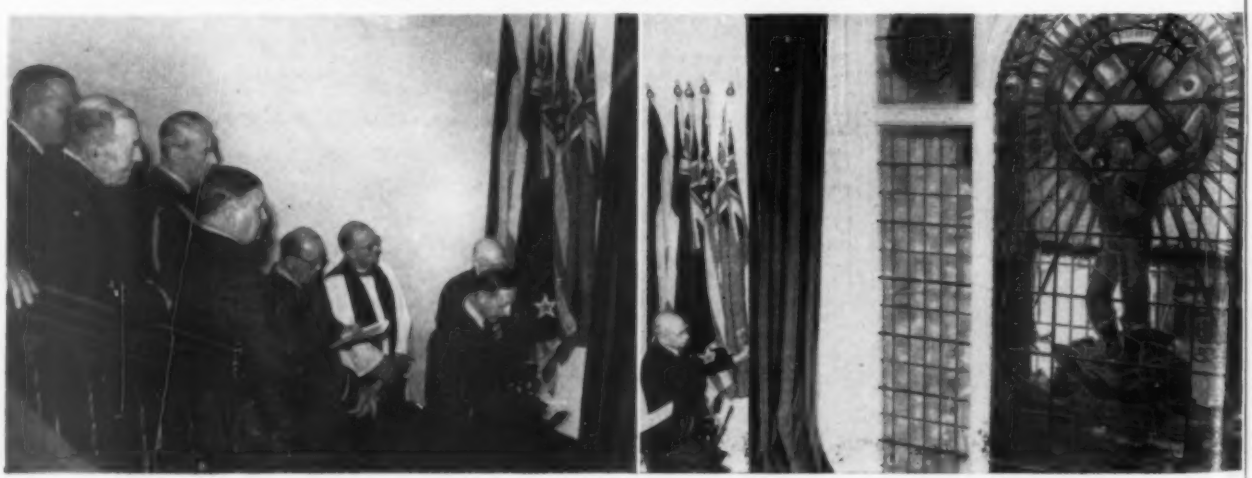
Youth Interchange Scheme

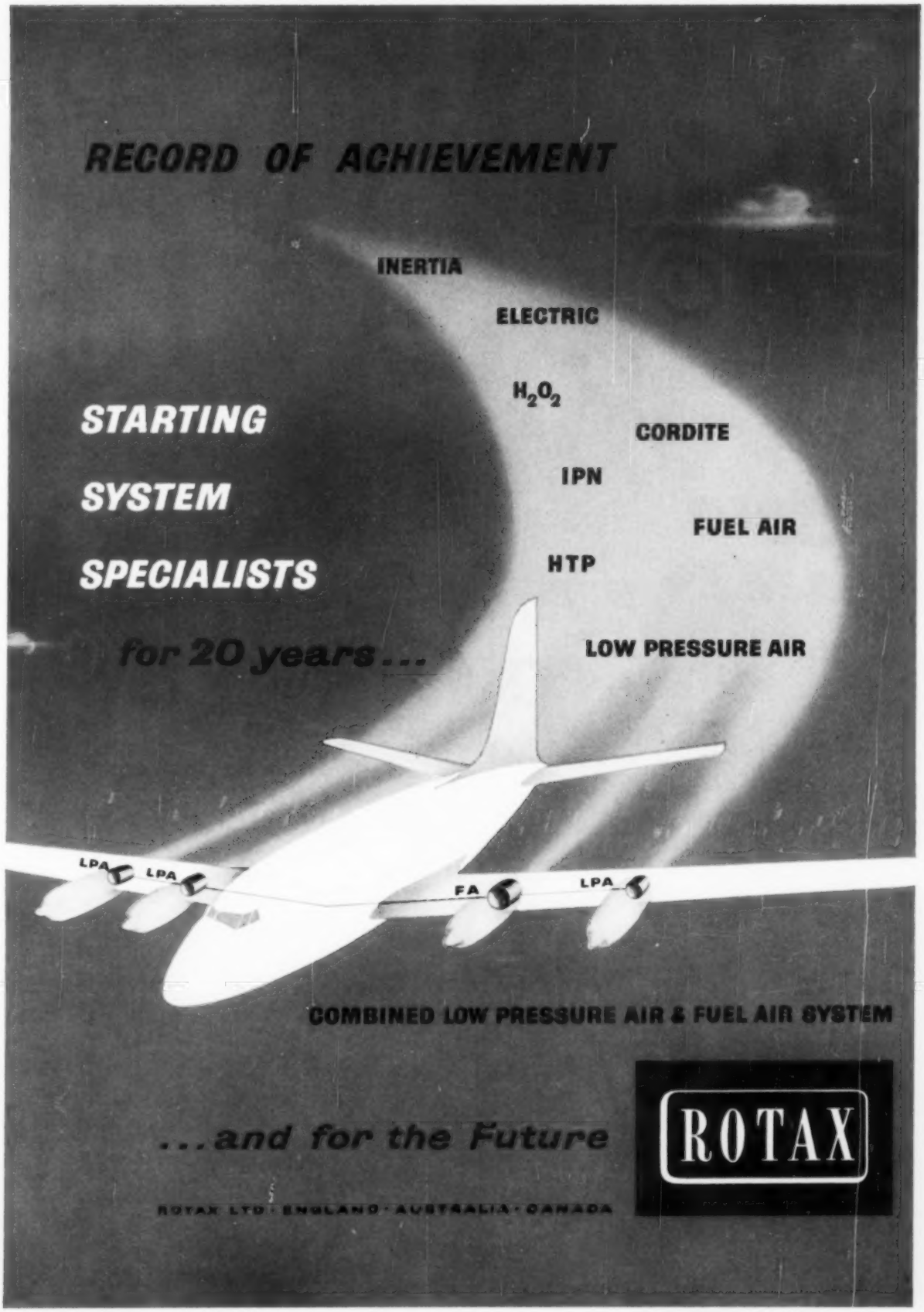
ARRANGEMENTS have been completed for the interchange of young people between the ages of 16 and 20 for two-week holidays at British and French flying clubs. Details of the scheme, which has been agreed between the Association of British Aero Clubs and the Fédération Aéronautique de l'Union Française, are obtainable from the A.B.A.C. at 7c Lower Belgrave Street, London, S.W.1.

The Rocket Symposium

TOMORROW, when the High Altitude and Satellite Rockets Exhibition—organized jointly by the Royal Aeronautical Society, the British Interplanetary Society and the College of Aeronautics in connection with their Rocket Symposium—is held at the College of Aeronautics, Cranfield, Bletchley, Bucks, coaches will leave Caxton Hall, Caxton Street, London, S.W.1, for Cranfield; the return fare is 10s 6d (for coach reservations telephone TATe Gallery 9371).

AT THE UNVEILING of a commemorative window in the headquarters of Coastal Command at Northwood, Middx, are seen (left to right) Marshal of the R.A.F. Sir John Slessor; Admiral of the Fleet Sir Charles M. Forbes; Air Chief Marshal Sir Dermot Boyle; Marshal of the R.A.F. Lord Douglas of Kirtleside; Air Marshal Sir Bryan Reynolds; Rev. Canon A. S. Giles; A.V-M. C. E. Chilton; and Air Chief Marshal Sir Frederick Bowhill. The window, planned by A.V-M. Chilton and executed by A/C. (now Mr.) Norman Attwood, marks Coastal Command's 21st birthday and commemorates its part in the Second World War.

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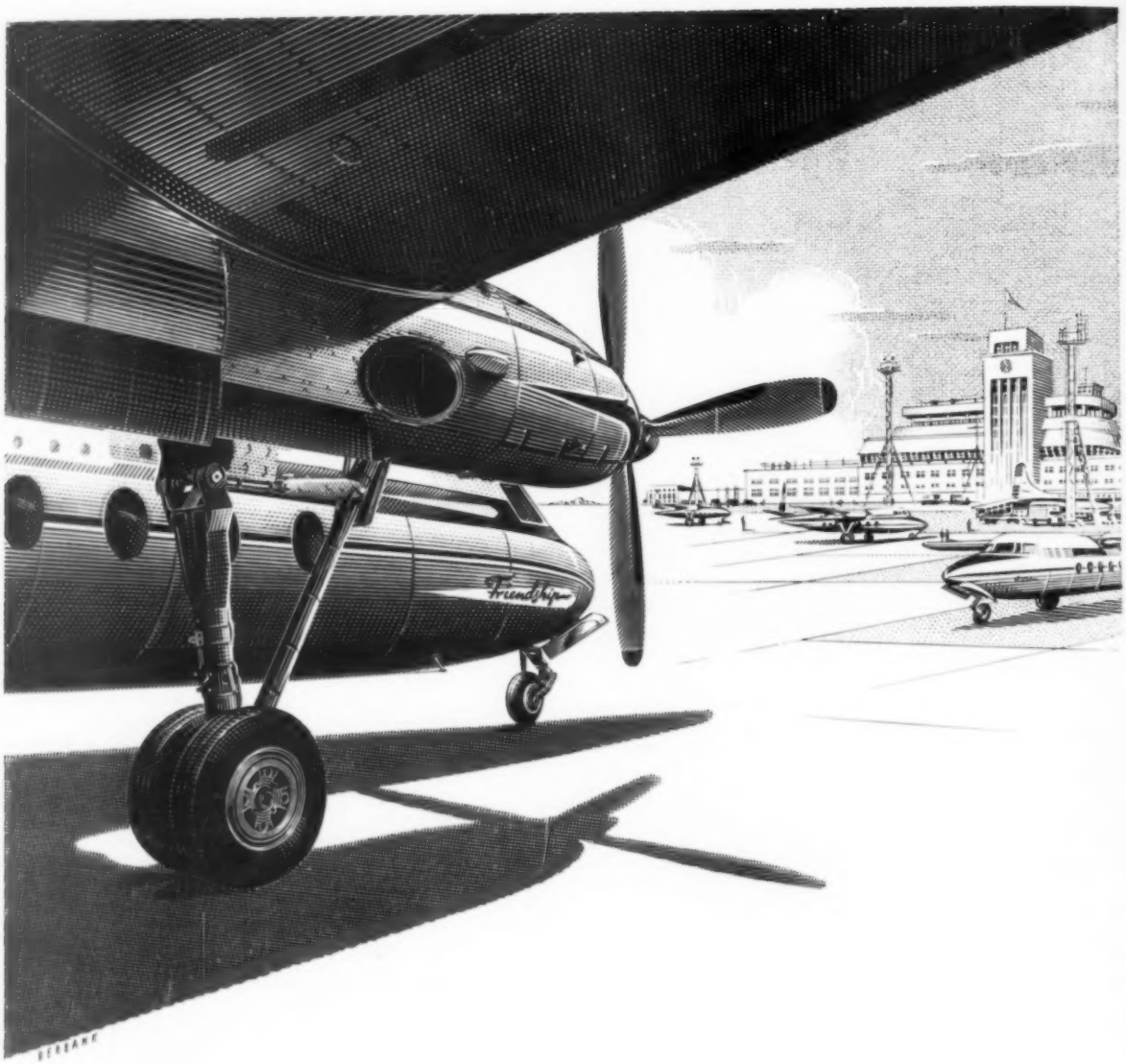

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Soaring Flight

THIS ten-page section of "Flight" is devoted to various aspects of the art of gliding and soaring. Interest in the sport in this country has never been greater, and in one week's time the National Championships—on the largest scale ever—will begin at Lasham in Hampshire. In the following pages are included advance details of the championships, a glance back at the early gliding days, and articles on flying the world champion two-seat sailplane (with cut-away drawing) and on gliding centres in this country, France and the Netherlands. Our report of the National Gliding Championships—which take place from July 27 to August 5, with the official opening by the Duke of Edinburgh on July 28—will begin in our issue of August 2 and will be fully illustrated.

THIS YEAR'S NATIONAL CHAMPIONSHIPS

OVER 70 sailplanes and more than 100 pilots have entered for this year's Championships. Some of these pilots are of international standard and want exacting flying with strong competition, while others come to get ten days' enjoyable flying with some friendly rivalry, plus the hope of gaining their "Gold C" distance qualification (187 miles). This difference both of purpose and skill has made it desirable to divide the competitors into two groups with separate tasks to fly.

This year, then, there will be two categories or leagues, and most pilots can select the league in which they wish to fly. Those who cannot choose are pilots who have flown in World Championships or who have been placed in the first five in any of the previous three Nationals: such pilots must fly in League 1. Compulsorily flying in League 2 are pilots who have never flown in championships before, and who have not got a Gold C. Possession of this qualification gives these pilots the right to choose. Approximately 27 gliders will be in League 1 and 45 in League 2. More than one pilot can fly on one aircraft, and there is no separate contest either for two-seaters or for women.

The daily tasks from which the organizers can choose are:—

(1) *Free Distance:* Competitors go as far as they can in any direction.

(2) *Pilot-selected Goal:* Competitors choose direction and distance, and obtain a bonus if they arrive at their declared destination.

(3) *Distance along a Set Line:* This may be straight or a dog-leg, but there is an increasing penalty for divergence.

(4) *Races to a Fixed Goal, Out-and-Return, or around a Triangular Course:* In races more marks are given for speed than for distance flown, so that a pilot who fails to arrive scores very badly.

The tasks which League 1 competitors are likely to have, weather permitting, will consist mainly of 100 km, 200 km and 300 km triangles, or flights in set directions with some windward component. This type of flying calls for great skill in centering and climbing in thermals without any wasted time or effort; it also demands experience and knowledge of navigation and of relating height possessed, or to be gained, with distance to be flown. The expert pilot is the one who arrives over the finishing line with merely enough height to pull up and make a safe landing; the inexpert is the one who either arrives on foot from the undershoot or who appears over the line at 3,000ft, diving furiously with his air-brakes open.

The tasks in League 2 will place less premium on skill in speed flying, not only because many of the pilots in this league will not have had the opportunity to develop this sort of skill but because, in many cases, their gliders will not have the performance to make headway against any other than light winds. Every effort will be made to give pilots the opportunity of doing the 187 miles (300 km) distance for their Gold C. If conditions are very good the task will be set as a goal race, but it is more likely that it will be given as either pure distance, or distance along a set line. One of the difficulties of getting Gold Cs in England is the nearness of the sea. From Lasham, in Hampshire, the most practical solutions appear to be as follows:—

Northerly Winds: A dog-leg course Lasham-Lewes and then west towards Exeter; although the cross-wind component is great, an appreciable amount of the early part of the flight can be done in the region of the South Downs, which are soarable in northerly winds.

Easterly Winds: Straight, towards Perranporth or St. David's Head.

Southerly Winds: Straight, usually towards Driffield, and using Lincoln Edge.

Westerly Winds: A dog-leg, probably to Norwich or Yarmouth, turning at Edgehill or Kettering respectively.

When League 2 competitors are surfeited with distance flying or when the wind is light, there will be races of approximately 100 km, mostly over a triangular course.

Scoring is carried out by means of marks and points allocated according to a number of simple formulæ. These are worked out so that the glider which does the best flight of the day is awarded 100 points, with the rest of the field in proportion. On each day a minimum contest performance is specified. No marks are given for altitude or for duration.

Since each glider may be flown by more than one pilot, points are awarded to the aircraft and not to the individual, the winning glider being the one that has accumulated the largest number of points throughout the championships. As a maximum of 100 points is given each day, the possible total at the end of four flying days will be 400 points. It is laid down in the rules, however, that each glider's worst day will be disregarded if there are more than four contest days. If there are six contest days, the possible total score which any glider can obtain is 500. Each league will have separate marking and its own prizewinners.

All launches are to be by aero-tow, and a competitor can select his own time of take-off by putting his name against any vacant space on the starting board, which will be marked with 1½ minute time-intervals.

There will be starting and finishing lines for all races, and times will be recorded as the gliders are observed crossing, the aircraft with the lowest elapsed time being the winner on that day. If a pilot fails to cross the starting line or is not observed, his starting time will be taken as that of his release from the tow. A. W.

SOARING PROGRESS

A BRIEF HISTORY OF BRITISH GLIDING

By PETER W. BROOKS

THE glider was a British invention which is historically important primarily because it was the machine from which the power-driven aeroplane was developed. Rather like the sailing-boat on water, however, the glider has survived as a pleasure and sporting craft; and it is with the development of sporting gliding and soaring in this country that this article is concerned.

To trace the origins of the story, it is necessary to go back nearly 150 years to an article published in the *Philosophical Magazine* in 1809-10. In this article Sir George Cayley, a remarkable country squire of Brompton Hall near Scarborough in Yorkshire, defined for the first time the basic principles of fixed-wing flight. Cayley is believed to have originally formulated his ideas about fixed-wing flying machines in 1799. Later, he built model and full-sized gliders which were flown successfully, and he also published numerous articles about his ideas and experiments. Towards the end of his life, in 1852-53, one of Cayley's gliders may have achieved the first successful flights in history to be made by a heavier-than-air machine. Unconfirmed recollections handed down within the Cayley family record at least one spectacular glide in which the machine was flown by the coachman. The latter apparently thought so little of the honour, however, that he "gave notice" on landing!

We shall probably never know whether Cayley really did achieve successful human flight. However, there is no doubt that his ideas were the foundations on which all subsequent work in the heavier-than-air field was built. Two other Englishmen, W. S. Henson and J. Stringfellow, took some of the most important next steps in the evolution of powered flight (in the mid-nineteenth century) by proposing designs and building models which gave practical form to Cayley's concepts. But it was a German, Otto Lilienthal, who in the final decade of the century at last translated Cayley's proposals into practical full-sized gliders which achieved properly authenticated flights.

Outstanding amongst several disciples of Lilienthal in other countries was P. S. Pilcher who, also in the 1890s, made prolonged gliding experiments in this country. He was the first authenticated British glider pilot, and his first controlled flight was at Wallacetown Farm, near Cardross on the North bank of the Clyde, on September 12, 1895. His Bat glider, which was of the "hanging" variety (controlled by the pilot swinging his suspended body), made a flight of some 20 seconds' duration during which a little height may have been momentarily gained in slope lift. Later Pilcher built other gliders and made longer flights of up to a minute, many of them following towed launches of a type which anticipated by many years the auto-tow and winch-launching methods of today. Pilcher lost his life in an accident when one of his gliders suffered structural failure in flight on September 30, 1899.

A little over four years later, on December 17, 1903, the American brothers Wilbur and Orville Wright, after extensive gliding experiments which continued the work of Lilienthal and Pilcher, achieved the first successful powered-aeroplane flights in history and thereby brought to an end the first gliding era. The glider had played its part in man's "conquest of the air." Thereafter, it became only a sideline to the main stream of aircraft development. From this time the history of British gliding falls into four distinct phases.

The Experimental Period (1905-1914). Gliding experimenters in the United Kingdom early in the present century were still primarily concerned with the solution of the problem of powered flight. This was because the success of the Wright brothers at the end of 1903 was not generally believed in Europe until the brothers visited France and demonstrated their machine in 1908. The first successful flight by an aeroplane on this side of the Atlantic had meanwhile taken place in France in 1906.

An American cowboy showman, "Colonel" S. F. Cody (who later became a British subject), was one of the first in this country to follow Pilcher's example of practical gliding experiments. During the second half of 1905 he built a large "hanging" glider whose biplane structure was based on the design of the man-lifting kites in the use of which Cody was then instructing the Royal Engineers. This glider made numerous successful glides at Burn Hill near Caesar's Camp, Aldershot. Later, Cody designed a pilotless powered machine of similar design which made a successful flight of 4½ minutes early in 1907. Finally, on May 16, 1908, he achieved the first powered man-carrying flight in this country using a new, larger machine built in the official Balloon Factory at Farnborough—ancestor of the R.A.E. Thereafter Cody concentrated on powered aircraft until his death in a flying accident in 1913.

In parallel with Cody's work, another experimenter at the Balloon Factory, J. W. Dunne, built both gliders and powered machines in the period 1906-09. Dunne had made experiments with model gliders from 1904. He advocated a swept-wing tailless configuration which gave marked inherent stability. In the summer of 1907 the first Dunne aeroplane was taken to Glen Tilt near Blair Atholl in Scotland where a successful gliding flight was made, under conditions of strict secrecy, by Colonel J. E. Capper, R.E., Superintendent of the Balloon Factory. In the following year these experiments were continued at the same place using a later powered aeroplane and a glider. The aeroplane only made a short hop but the glider achieved some quite spectacular flights in winds of over 30 m.p.h. while being flown by Capt. L. D. L. Gibbs of the Royal Field Artillery. Dunne later developed his design into a successful powered aeroplane.

Another experimenter at this time was J. B. Weiss who built a series of model gliders between 1905 and 1908 and flew them from Amberley Mount in Sussex. These also were tailless designs intended to offer marked stability in flight. Weiss built a full-sized glider of the same design in 1908 and this was used by E. C. Gordon England on June 27, 1909, for what was perhaps the first soaring flight in history during which there was a clearly-defined gain of height—reported as 40ft. This was achieved in the slope-lift over Amberley Mount during a 58-second flight which covered half a mile. Soon afterwards, Weiss and Gordon England formed the Amberley Aviation Society whose members continued the gliding experiments. This organization can, perhaps, be regarded as the first British gliding club.

From 1909 to 1914 many enterprising people in this country, as elsewhere, undertook gliding experiments either as a preliminary to power flying or out of enthusiasm for the new sport. Some of these people followed the Lilienthal school and used "hanging" gliders; others were influenced by the example of the Wrights, using machines inspired more or less directly from their American prototype; others again followed original lines or incorporated combinations of the ideas of several of the best-known and more successful pioneers. There is no record that anybody in this country achieved anything more than simple glides during this period. In the United States on October 24, 1911, however, Orville Wright achieved the first soaring flight in history during which the machine remained for an appreciable period—9¾ minutes—at a height greater than the take-off point. This flight, which lasted a total of eleven minutes and was one of several, was made in the slope lift over the sand dunes at Cape Cod in North Carolina. It marks the Wrights as the first true practitioners of soaring, as of powered, flight.

The First Popular Movement (1922-23). The first organized British gliding movement owed its origins to the Treaty of Versailles at the end of the First World War. The Treaty rigidly restricted air developments in Germany and led to the organization of a popular gliding movement with which to satisfy the enthusiasm for the air of that country's youth. The movement was largely inspired by Oskar Ursinus, the editor of *Flugsport*, who organized a meeting at the Wasserkuppe in the Rhön Mountains in August 1920. A gliding meeting had been held in the Rhön as early as 1912 when several groups of enthusiasts got together for a competition. They did not, however, achieve anything of much significance at that time. The 1920 meeting was supported by the German govern-

F. P. Raynham flying his Handasyde glider at the 1922 Itford meeting.

Left, Robert Kronfeld and Gordon England, after the former's 1931 cross-channel flight. Right, the tandem-winged Peyret glider flown by Maneyrol at Itford in 1922, which set up a world duration record of 3 hr 21 min.

ment and by various firms in the aircraft industry. It generated amazing enthusiasm although no actual soaring was done. The longest glide was of less than three minutes in duration.

This competition marked the beginning of the German gliding movement which went forward continuously from then until the Second World War. The second of the annual Rhön competitions was held in August 1921 and, although no particularly remarkable flights were recorded during the contest, big progress was made during the weeks which followed. On September 13, 1921, F. Harth made a soaring flight of 21 minutes during which he achieved a gain of height of 400ft. Orville Wright's ten-year-old record had at last been beaten.

The third Rhön competitions were held in 1922 and they marked the true beginning of soaring flight. Martens made the first flight of more than an hour. This was followed by one of two hours on the following day. Finally, on August 24, 1922, the record was raised to 3 hr 6 min. The effect of these startling slope-soaring performances was widespread. A soaring competition was organized in France, with disappointing results, and in England the *Daily Mail* offered a prize of £1,000 for a competition to be held at Itford in Sussex between October 16 and 21, 1922. This competition aroused great enthusiasm and no less than 37 entries were received, an astonishingly large number in view of the short time available for preparation.

Anthony Fokker, the famous Dutch aircraft designer who had flown at the Wasserkuppe, came to Itford and quickly demonstrated the technique of slope-soaring which was followed by other competitors. Thirteen machines were flown and five succeeded in soaring. A total of just over nine hours was flown during the week of the competition and on the last day a Frenchman, A. Maneyrol, flying a Peyret tandem monoplane, won the main prize with a flight of 3 hr 21 min which established a new world record. The best British performance was a flight of 1 hr 53 min by Fred Raynham in a Handasyde glider.

The Itford competition attracted a great deal of attention and it looked for a time as if a popular gliding movement would be established in this country. A number of clubs were formed but were short-lived. In 1923 what was probably the first British gliding school was formed at Whiteley Bank in the Isle of Wight by Capt. F. Warren Merriam, a famous flying instructor of the pre-1914 period, but this also was before its time and soon faded away. Even in Germany, much attention was being given at this time to developing gliders into ultra-light aeroplanes. In Britain this tendency was particularly marked and led to the almost complete abandonment of gliding for the next eight years. Attention shifted instead to ultra-light aeroplanes which in turn evolved into the somewhat larger and more powerful aircraft which, in due course, made possible the growth of a world-wide light aeroplane movement.

In Germany—and, to a lesser extent, in France, Belgium and Russia—gliding continued but, even in these countries, the movement passed through a difficult period. The slope-soaring endurance record was progressively increased but enthusiasm waned because the possibilities of gliding, confined only to hillsides, seemed to be disappointingly limited. Continued progress in Germany was largely made possible by regular government subsidies after 1925.

The Revival (1930-1939). At the ninth Rhön meeting on August 6, 1928, Robert Kronfeld, who had learnt to fly the previous year and was destined to become famous, made the first thermal soaring flight in history. Max Kegel had flown 35 miles in 1926 after being accidentally drawn up into a thunderstorm but his experience had been so harrowing that nobody was encouraged to repeat it. Kronfeld's flight was different and was soon widely imitated. Thermal soaring had arrived.

By 1929 gliding had sufficiently thrown off the bonds of slope soaring for a rapid revival of interest to take place in many countries. Reports published in the technical press in Britain led Mr. D. C. Culver to suggest to C. G. Grey, editor of *The Aeroplane*, that a meeting be called to start an organized British gliding movement. Mr. Grey arranged the famous "gliding lunch" of December 4, 1929, and the British Gliding Association was born. The same meeting led to the formation of the London Gliding Club which had its first flying meeting near Guildford on March 16, 1930. One of those at the lunch, C. H. Lowe-Wylde, formed the Kent Gliding Club on January 4, 1930, and undertook the construction of the first British primary glider, the BG.101 Columbus, which remained in use until 1939.

Initially, the above were to be the most important bodies in the British gliding movement. Expansion was rapid, however, and within a month 15 clubs had been formed and three "A" Certificates (the lowest gliding qualification) gained. It then became obvious that what was needed was a means of stimulating the clubs which had been formed and that something should be done to ensure that they got under way along the right lines. Thanks to the generosity of Lord (then Sir Charles) Wakefield, who presented £1,000, the B.G.A. was able to arrange with the Rhön-Rossitten Gessellschaft—the governing body for gliding in Germany—for Robert Kronfeld to give a series of demonstrations with his Wien sailplane in this country. The *Daily Express* obtained another prominent German pilot, C. Maggersuppe, to come over at the same time.

The first demonstrations by Kronfeld and Maggersuppe were made between June 5 and 15, 1930 at the same historic Itford site where the *Daily Mail* competitions had been held eight years earlier. Large crowds watched flying by the experts and by the several clubs which turned up with their aircraft. The first British "C" Certificate was won by Capt. C. H. Latimer-Needham, who flew for over an hour in the London Club's Prufling intermediate glider which had just arrived from Germany. Three other "Cs" were gained during the meeting and Kronfeld made a spectacular cross-country flight of 50 miles, slope-soaring along the South Downs to Portsmouth.

Before returning to Germany, Kronfeld gave gliding demonstrations in various parts of the country as well as before the Prince of Wales (now the Duke of Windsor) and Prince George (later King George VI). When he left, 37 clubs were in existence. This number had increased to 50 by the end of the year, by which time 100 gliders were in use.

The year 1931 saw the continued healthy growth of the movement. Kronfeld again visited England and made several thermal-soaring flights including one across London. Aero-towing, which had first been tried in Germany in 1927, was demonstrated at Hanworth by Kronfeld, Lowe-Wylde and E. L. Mole. This method of launching was, however, only infrequently used for some years. Clubs either continued to rely on the German "bungy" launch or went over to auto-towing which was first demonstrated in this country by Lowe-Wylde in January 1931. Lowe-Wylde was also a protagonist of two-seater training but this did not come into widespread use for another 20 years. Until then, the great majority of instruction continued to be given in single-seat gliders. In 1935 winch-laurching started coming into vogue—initially, notably with the Cambridge University Gliding Club—and gradually displaced auto-towing. Since the Second World War auto-towing has regained some of its popularity, mainly on aerodromes with runways.

In 1931 the first meeting of the International Commission for Motorless Flight (ISTUS) was held in London. This body concerned itself with the technical and scientific problems of the sport. It was ISTUS that established the "Silver C" award (in 1931) and the "Gold C" (in 1938) as international measures of piloting competence. Since the War, the Fédération Aéronautique Internationale, which has taken over this responsibility, has added "Diamond" awards to keep pace with the ever-advancing level of skill. The numbers of these awards, and the more elementary "A," "B" and "C" Certificates, which have been won in this country over the years are given in Table 1 overleaf. They show clearly the steady expansion of the movement as well as the constantly rising standard of performance.

SOARING PROGRESS . . .

TABLE 1: GLIDING CERTIFICATES 1930-56

Year	A	B	C	Silver C	Gold C	Diamonds		
						Dist.	Ht.	Goal
1930	61	4	2	—	—	—	—	—
1931	182	40	17	—	—	—	—	—
1932	74	57	31	—	—	—	—	—
1933	33	32	20	—	—	—	—	—
1934	46	24	21	2	—	—	—	—
1935	113	77	43	5	—	—	—	—
1936	108	86	81	16	—	—	—	—
1937	245	195	133	7	—	—	—	—
1938	339	234	147	23	—	—	—	—
1939	441	199	110	7	—	—	—	—
1940	20	7	4	—	—	—	—	—
1941	—	—	—	—	—	—	—	—
1942	2	1	1	—	—	—	—	—
1943	62	16	5	—	—	—	—	—
1944	555	99	6	—	—	—	—	—
1945	1627	273	70	—	—	—	—	—
1946	2176	615	296	20	—	—	—	—
1947	1515	604	341	43	1	—	—	—
1948	1854	640	424	56	1	—	—	3
1949	1764	493	331	67	3	—	—	1
1950	1603	644	242	47	2	—	2	—
1951	1423	836	240	63	—	—	—	2
1952	1613	1492	355	47	3	—	1	3
1953	1591	1622	272	38	3	—	—	2
1954	1712	1726	328	34	1	—	1	—
1955	1877	1892	348	71	4	1	1	3
1956	1815	1836	315	69	3	—	—	5

After the enthusiasm of the first years of its revival in 1930, British gliding suffered an inevitable period of recession. Thus, by 1932, the number of clubs had declined to 41 and only a few of these were really active. Indeed, for a time, practically the only soaring in the country was done by members of the London Gliding Club at Dunstable. The first cross-country to be made by a British pilot was made by Mungo Buxton from Tottenhoe to Luton (6½ miles) in a German Professor glider on August 15, 1931.

Gradually, the movement gathered momentum. The first British-designed sailplanes were built and flown: R.F.D. Albatross, Airspeed Tern, Baynes Scud, Cloudcraft Phantom, Manuel Wren and many others, including the series of successful designs produced by Slingsby—Falcon I - III, Hjordis (designed by Buxton), Kite, Gull, Petrel and others. By 1939, 17 out of the 29 aircraft in the annual national competitions were British. Although technically still some way behind the Germans in 1939, British sailplane designs were showing great promise—a promise which has been fulfilled since the War. The British duration record was steadily increased during the 1930s until in 1937, and again in 1938, Britain gained the World two-seat duration record.

The first clear-air thermal soaring in Britain was done by G. E. Collins. On July 3, 1933, at Huish, he made a flight of nearly six miles in a B.A.C. VII two-seater with his wife as passenger, and it was on this flight that a variometer was used for the first time by a British pilot. Collins soon improved on this performance and became the first British "Silver C" pilot. He lost his life in an accident in 1935. His example was followed by P. A. Wills—who achieved the first British "Gold C" in 1938—J. S. Fox, C. D. G. Nicholson and many others. On September 8, 1937, John Simpson made the first British flight in a standing wave over the Long Mynd. This followed the first wave flights in 1933 by Hans Deutschmann and Wolf Hirth in the lee of the Riesengeburge Mountains in Bohemia. This type of soaring was to make great strides after the Second World War. By 1939, the British distance record stood at 209 miles (world record 466 miles) and the height record at 14,170ft (the world record was then 22,434ft).

A significant development in 1935 was a decision by the Government to provide gliding with a small annual subsidy. For the next five years, £5,000 was received annually, the bulk of the money going to the clubs to help them keep down their flying fees. By the mid 1930s, a number of clubs were well-established at gliding centres which have since become famous up and down the country; the Yorkshire Club at Sutton Bank from 1934, the Derby and Lancs Club at Camphill from 1935 and the Midland Club at the Long Mynd from 1936, to mention only the best-known. By September 1939, there were 39 active clubs in the United Kingdom of which ten offered advanced soaring facilities.

The B.G.A. had hopes of a British entry for the international competitions in Germany as early as 1931 but this had been prevented by financial difficulties. In 1937, however, a British team was sent to the Wasserkuppe, and it was equipped entirely with British-designed gliders. Although not placed, this entry into international competition soaring foreshadowed Britain's successful efforts in this field after the war. Another international event in 1939 will serve to close this phase of gliding history: on April 22, G. H. Stephenson in a Gull I made the first successful soaring flight across the Channel after taking-off from a winch-launch at Dunstable. Straight glides across the Channel, after releasing at height from aero-tows near the coast, had first been made by Lissant Beardmore and Kronfeld in June 1931, the latter winning a £1,000 prize from the *Daily Mail*.

The Post-War Period (from 1946). British gliding tried hard to keep going at the beginning of the war and, by local arrangements with the military authorities, did succeed in doing so to a small extent until the end of the "phoney-war" period in 1940. Thereafter, most glider pilots had more serious things to do and gliding was limited to the large-scale elementary training of cadets at many Air Training Corps gliding schools up and down the country. The military use of gliders during the War does not concern us here. Some of the instructors at the A.T.C. schools had limited opportunities for local soaring but it was not until January 1, 1946, that the civil gliding clubs resumed operations. On that day, G. O. Smith was winch-launched at Camphill in a Kite and thus inaugurated the post-war operations of the Derby and Lancs Club. The London and Yorkshire Clubs resumed operations on January 5 and the Midland Club on the following day.

Progress in the reviving movement was at first slow. There was a lack of sites, accommodation, equipment, qualified instructors and, most serious of all, high-performance sailplanes. There was also no longer a Government subsidy. However, all these difficulties were gradually overcome and, by the summer of 1947, British gliding was well on the way to a return to its pre-war state. This was clearly shown at the first National Competitions held at the Royal Naval Air Station at Bramcote in July. The arrangements for the meeting emphasized the changed post-war conditions. These were the first British championships held on a flat site and the first to make use of aero-towing. They were a great success and have been followed by a continuation of the annual series which started originally in 1930. Since 1947 (Table 2) the National Competitions have usually been held on alternate years to avoid clashing with the biannual International Championships.

TABLE 2: POST-WAR BRITISH NATIONAL GLIDING COMPETITIONS

Year	Dates	Place	No. of entries	Winner	Hours flown	Miles flown
1947	June 21/29	Bramcote	27	P. A. Wills (Weihe)		4,376
1949	Aug. 19/28	Camphill	30	P. A. Wills (Weihe)		
1950	July 22/30	Camphill	30	P. A. Wills (Weihe)	535	6,050
1951	July 21/29	Camphill	35	R. C. Forbes (Sky)	809	7,208
1953	July 25/ Aug. 3	Camphill	37	G. H. Stephenson (Sky)	916	7,956
1955	July 23/Aug. 1	Lasham	39	P. A. Wills (Sky)	767	14,787

The post-war shortage of high-performance sailplanes was quickly met by the production in this country of the D.F.S. Meise sailplane designed in 1938 by Hans Jacobs, the famous German designer. Built as the Olympia by Elliotts of Newbury, this sailplane has proved ideal as a club aircraft. Alongside it, Slingsby Sailplanes have produced a series of designs—Kite 2, Gull 4, Sky and Skylark—which have also catered for club requirements and provided pilots with increasingly competitive aircraft in national and international competitions. These Slingsby designs have now gone a long way towards establishing a technical ascendancy for British sailplanes. These can now be justifiably claimed as being as good as, or better than, those in production elsewhere. The B.G.A. flight-test groups, formed since the war, have made important contributions to this progress.

Post-war advances in soaring technique have been as spectacular as in earlier years. Speed flying over fixed courses has been perhaps the most important development. An extension of flying to a previously declared goal, it is perhaps the most exacting measure of skill so far devised. The world record for a flight over 100 km now stands at 59 m.p.h. Britain holds the 300 km record with a speed of 48 m.p.h.

Another significant development has been the swing-over during the past eight years to dual instruction. The old solo method, inherited from the Germans, has now been superseded by systematic dual instruction given by fully-qualified and certificated instructors using specially-developed two-seat training gliders, notably the Slingsby T-21 and T-31. A leading part in introducing these new techniques has been taken by the re-formed Surrey Gliding Club at Redhill, and later at Lasham, which has in recent years become the largest gliding centre in the country.

Today there are 37 gliding clubs active in the United Kingdom. Together with private owners, they operate over 200 aircraft and have a membership of about 3,500. The British distance record stands at 318 miles (world record: 538 miles) and the height record at 37,000ft (the world record is over 42,000ft).

Still unsubsidized—although much helped by a Trust set up by Lord Kemsley in 1947—the British gliding movement has today attained a strong and healthy position. The victories by British pilots and aircraft in the single-seat World Championships in 1952 and in the two-seat Championships last year have set the seal on this achievement.

Gliders at La Ferté Alais, one of the two soaring centres visited by the author during his fortnight in France. It is situated only 20 miles from Paris.

BEETROOTS IN FRANCE

IMPRESSIONS OF A CONTINENTAL GLIDING HOLIDAY

By PHILIP WILLS

THE plot was to take my Skylark for a fortnight to France, generally to Have Fun, but particularly to have a shot at my third and last Diamond, that elusive 500 km distance flight which has so far baffled all British sailplane pilots in our own country—mainly because the British Isles are too small in all the practicable directions, and one does not want to have to swim back.

We first selected La Ferté Alais, a gliding centre near Paris, which had the additional advantage that my daughter Vanessa was at school in Paris, and could be relied on to show us the sights if the gliding weather failed. But, having arranged this, we received an invitation from the Aero Club de l'Ouest de la France to fly in their *Huit Jours d'Angers*, a small international contest which they were holding during the last eight days of our holiday. The invitation and the exact coincidence were too good to be missed, and we gladly accepted.

So Joan Price, my wife Kitty and I set forth on May 30, 1957. Our start was somewhat hectic since, through various minor mishaps, we were an hour late at Dover. Once or twice on the way there, in my zeal to catch the boat, we nearly exceeded the 30 m.p.h. speed limit. But catch it we did—the Dover-Dunkirk train ferry—and after the engine had neatly shunted its trucks into the belly of the whale there was space left for us to back our 30ft trailer in front of one of the lines of refrigerated trucks. We then went upstairs to the bar to recover, having left our address with a gentleman on the quay whose offside mudguard would never be quite the same again.

* * *

And so we arrived at La Ferté Alais on the morning of Friday, May 31, to be welcomed by M. Paul Lepanse, the chief, and by a display of aircraft and equipment which would make any British club-member's mouth water. Being only 20 miles from Paris, we had expected somewhat suburban surroundings, but Paris turns out to be a surprisingly compact city, and in fact we were in the depths of a beautiful countryside. La Ferté Alais itself is a small old town in a small valley boasting a small cathedral that dates back around 1,000 years. One side of the valley is wooded, and on the top of the hill lies the aerodrome, surrounded on three sides by tree-covered slopes. At this time of the year the woods were carpeted with a profusion of wild flowers which was quite enchanting to behold.

The grass aerodrome is bordered by three hangars, a dormitory, workshop, and a club-house in which one can eat and drink well and (for France) cheaply. There seemed to be more sailplanes, towing aircraft and equipment than could ever be needed. In fact nothing was lacking except that traditional vacuum in all French gliding clubs—plumbing. We came to the conclusion that this must be the reason that most French gliding clubs are established amongst woods.

The next five days passed like lightning. The weather was mainly hot and still, a blue sky with late-forming cumulus. No weather for my 500 km, so I had four shots at breaking the British 100 km triangle speed record. All failed, for although the upcurrents were strong for an hour or two each afternoon the downcurrents seemed even stronger; so much so that on no less than three of these occasions, trying a scientific last-glide dash back to the aerodrome (staring at Tony Deane-Drummond's chart the while), I was caught out by the rapid rate of descent and landed a few miles short. When one lands at the foot of the hill like this, the French call it *Aller aux vâches*, but in fact at this time of the year I found the best available landing strips consisted of young beetroots, or *betteraves*. So before we knew where we were my two (or three, when Vanessa was there) lady teammates were my better 'alves, and hence the title of this article.

Thus the sunny days flashed by; on some we flew, twice we motored in to Paris and emerged (just) unscathed. To anyone who thinks that London traffic jams are thick, let him try the Rue St. Honoré at 6 p.m. when all the shops and businesses are just closing. Petrol was still supposedly rationed, too.

We were due to report at Angers on Saturday and, when Thursday came, with clear blue skies and a dismal met-report that the air was too stable even to make local flights interesting and with no better prospects for the Friday, we decided it would be just as well to make a dash for it. So we hatched a hopeless plot to try a 500 km flight in a dog-leg path, starting off southwards towards St. Yan and the Rhône valley. The trailer was to go to Dijon and wait, for I might be able to make a turn about there, take a photograph to establish the turning point, and then go either south for Lyons and Marseilles, or north-east for the Saar.

Well, it didn't work, but I got as far south as Autun, 40 miles north of St. Yan, and then turned and flew back over Beaune to land at Dijon itself, a flight of just over 300 km. When I phoned back to La Ferté and said where I was, then asked where my trailer had last reported from, they went away and came back in a startled way to say "It's at Dijon, too." Not knowing the plot, they must have credited Beetroot K. with second sight.

By now a new problem was rearing up. Beetroots J. and K. were becoming increasingly French in their ways, and one of the lesser known customs of the French is Not to have Baths. Instead, most bedrooms contain various weird porcelain shapes designed to enable one to wash, thoroughly enough, but in sections: washing indeed becomes like a kind of somewhat gymnastic jig-saw puzzle. This was found to be a very intriguing custom and even when, after several days, Beetroot J. one morning discovered with some dismay that she had up to then overlooked her neck, I still found myself unable to drive my team into a one-hundred-per-cent bathroom.

However, that evening at Dijon they had motored and I had flown over 300 km and I decided on the stern method of taking one of our bedrooms with bathroom attached. Having paid for it anyway, the Beetroots realized the game was up—it would be a positive extravagance *not* to use it.

And so next morning we set off bright and clean for Angers, 500 km away to the west, and motored all day, first across high, green hills and valleys and then for the last 100 miles or more down the broad valley of the Loire, every signpost calling the name of some historic château.

We stayed the night in Angers and motored out in the bright morning light to the aerodrome at Avrillé, where we were met by M. Bellanger, vice-president of the club. We found 15 other competitors, but we were the only foreigners whose already-arranged holiday dates coincided. Anyway, our arrival made the meeting properly international, and we were very touched to see the Union Jack floating side-by-side with the Tricolour in front of the clubhouse on the aerodrome.

Space does not permit a daily account of the *Huit Jours* but the meeting was excellently run by this, the largest non-State sporting flying club in France. Five tasks were flown, and the winner was Camille Labar, flying an Air 102. He was flying head-and-shoulders above the rest of us, and I expect to see him representing France in World Championships in future. I fell down completely on one blue-thermal day which turned out to be rather a trap, and thus scored on only four of the five days. I was therefore lucky to find myself fourth, within a few points of the second and third-placed pilots. But two of the days will always stand out in my log-book.

The first was June 11. After the first two days, with briefing at 9 a.m. and no thermals before noon, the organization relaxed somewhat, and announced briefing at 10 a.m. And The Day promptly turned up. Up to then, no flight much in excess of 300 km had ever been made from Angers. But on this day, a 25 kt N.N.W. wind started forming cloud-streets before briefing-time had arrived, and by the time a flight along a track through Carcassonne, 560 km to the south, had been declared, and everyone was lined up

BEETROOTS IN FRANCE...

to start, it was nearly eleven o'clock. And, of course, on this day I was last of all in the launching order.

I don't want to relive that launch. The gliders all in position, the three tugs with engines running—but where was the pilot of No. 9? Hunt for him—no luck—push his machine out of the way, he is holding us all up. Away it goes, No. 9 arrives, angry arguments, back into position. Oh, No. 9, I don't know who you were, but some few Diamonds turned to ashes with your assistance that day.

At last, at last, my launch. Something *must* go wrong. Would the wheels drop off? They did. Would the cable break? No. Would I, in my frustration, release too soon? YES, I did, and rushed in torrential air back to the aerodrome. In ten seconds my wheels were on again, I was hooked on to a waiting tug, and away. In another ten minutes I was off and circling up in 10ft/sec lift—but the time was 11.40! Probably 200 km of distance already lost, on a day the like of which I have never seen before.

Streets of cumulus on every side. Under each cloud we rocketed up to cloudbase at 10ft/sec, then set off downwind. The country below fled back at over 100 m.p.h. as we dashed along between lift, first the vineyards of Anjou, then cornfields and woods, railways, straight-ruled roads. The first 100 km took us 70 minutes, Poitiers flashed by to port, in the next hour we covered 110 km, and the land began to become more hilly and wooded. Simultaneously the sky ahead became less alive and the cloud began to spread out in layer sheets, with lumps of cumulus spaced out far apart, no longer white and dazzling, but grey or sulphurously yellow under a shrouded sun.

I thought that possibly the trouble was caused by the high land below and that I might get back into better weather if I flew west of my track towards the flatter lands around Bordeaux. At the same time I altered my technique. Instead of dashing from cloud to nearby cloud at high speed, and stopping each climb at cloudbase, I circled up as high as possible inside each cloud and then carried out a long, flat glide through stable grey air to reach the next upcurrent.

We crossed the fabulous Dordogne at Domme and by 15.50, four hours out, I was about 50 km west of the 350 km mark on my track, but things looked even flatter to the west and the only sign of life seemed to be back on track near Cahors. So I altered course again and, at about 2,000ft, reached this town in its steep arid valley with the River Lot winding through. All the country hereabouts and for a hundred kilometres on either side is craggy and wooded and very bad for landing purposes, so I was glad to get in reach of the little aerodrome outside the town, but here I found a clear blue patch again and cumulus cloud, and once more climbed back to 7,000ft.

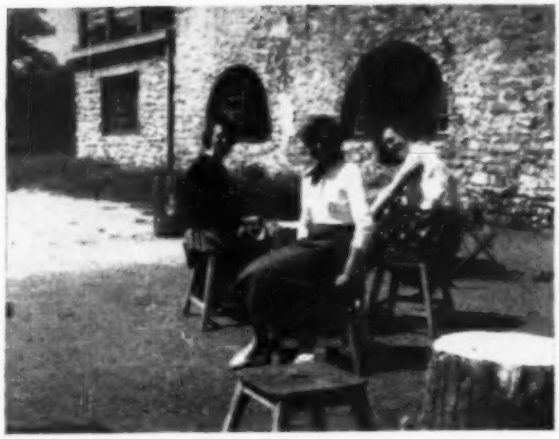
With hope once more aflame, I flew on down a valley, another cloud—a little lower this time, then a river flowing against a great mountain, and over this a shapeless, obviously dying cumulus mass. Dying or dead? It was a big question, for in that cloud lay, or had lain, my Diamond. If I could once more reach 6,000ft in it, I had in my pocket the last 80 km which lay between me and the 500 km line.

I reached it at 3,000ft—and found zero lift. I hunted and hunted, I twisted and turned. It was not dead, it was not alive. Half an hour before, even less, it must have been lifting. But now, like a leaking baloon, it was slowly collapsing. As my hand closed on it my Diamond, like the Jewels of Happiness, dissolved into thin air. The whole day turned out to have been a race to reach this decaying monster in time—and I had just lost it.

Ahead and downwind the country looked kinder, although the sky was quite flat, so I set off to stretch my glide as best I could. At 1,500ft I passed over a town called Gaillac with a small aerodrome, but my map showed another aerodrome about 10 miles on at Graulhet and with the wind behind me I reached this with 300ft to spare—465 km from Angers. And so, it must be tried again.

At 1.15 a.m. Beetroots J. and K. arrived. They had motored with the trailer 650 km in 12 hours—and they were gay and sympathetic and smiling. I like them.

We got back to Angers by 10 p.m. the next night, after 1,300 km of trailing. It's curious, but we all enjoyed it. On this astonishing day 14 of the 16 competing pilots exceeded 300 km, seven exceeded 400 km, and one landed on the 500 km line.



"Beetroots K., J. and V."—alias Mrs. Kitty Wills, Mrs. Joan Price and Miss Vanessa Wills, at La Ferté Alais.

* * *

The second day worth recording was the *Six Heures*. This was a novel task, consisting of a 50 km triangular course round which one had to fly for six hours. If you flew for six hours, *and landed back on the airfield*, your total distance covered was multiplied by a high factor; if you flew for less time or failed to get back to base, by a lower one. If you landed back at the airfield during the race, you could have up to three launches, but if you "went to the cows" (or beetroots) you were finished.

It sounded as if it might be dull or dangerous, through overcrowding of the air over so small a course. In fact it was neither, and surprisingly enough after the first half hour one scarcely saw another aircraft. I won't say it was a fascinating flight for the pilot, although I won it (and with it a startlingly large cash prize and a lovely glass bowl), but it was at last what we have been searching for for so long, a spectators' event. Those on the ground had a really exciting day and, by the time I landed, my Beetroots (what with the sun and the excitement) were nearly indistinguishable from the real thing.

And so we came to the end of our holiday, said goodbye to all our new friends at Angers, and left there at 8 p.m. At 12.30 the next day the old Ford steamed hotly to rest in the bowels of the Dunkirk Ferry, 550 km away.

We sat for three lazy hours in the blazing sun on the deck thinking it all over . . . That night in the rather tip-nose hotel at Angers that didn't really want us. The notice on the lattice roller-blind "*Pour remonter le store prière le tirer sur la courroie sans brutalité.*" Kitty had washed a blouse and hooked it on a hanger into a slat of the blind. In the morning I got up and sleepily pulled up the cord without noticing anything wrong. The blouse on its hanger rolled itself up into the roof. A little later, Kitty got up and started searching everywhere for her blouse. At last she saw a tag-end of it hanging forlornly down from the roller-blind. It hadn't needed much brutality to roll it up, but it needed a bit to unroll it down again . . .

The look on Joan's face when I tried to get her to eat one of my snails. (They weren't very nice anyway) . . .

Vanessa: "Daddy, they teach us how to handle our husbands! Apparently, when they come back from the office in the evening you have to greet them with simply *bags* of *accueil*. . . ."

The landing I made at La Daguenière, the second shot on an unsuccessful day. At the last moment I saw that the beetroot strip was 50ft wide (the span of the Skylark is 58ft). On the port side the contiguous strip consisted of exceedingly spiky vines, some 3ft high, while on the starboard side was young wheat. It was very necessary that, when my aircraft came to rest, the starboard wing and not the port should drop. If I put on starboard aileron too soon, I might ground-loop into the corn; if too late, the wrong wing might drop and spike itself on a vine. It was a situation which would have daunted one if one had had time to ponder, but in the few pregnant seconds available it seemed to solve itself, and as we came to rest, the starboard wing dropped quietly into the wheat . . .

And the Press photograph! This made our trip. It was on the first of the *Huit Jours*. A photograph of all the teams, on either side of me Beetroots J., K. and V. The caption read, in part "*l'Anglais Philip Wills; près de lui les trois jeunes femmes formant son équipe.*" I don't know which one of us felt most flattered.

There's nothing like taking a sailplane with you on a continental holiday. It gives everyone an entirely new slant on life.

Glider being taken for a walk: the tailless Fauvel AV-36 at Angers.

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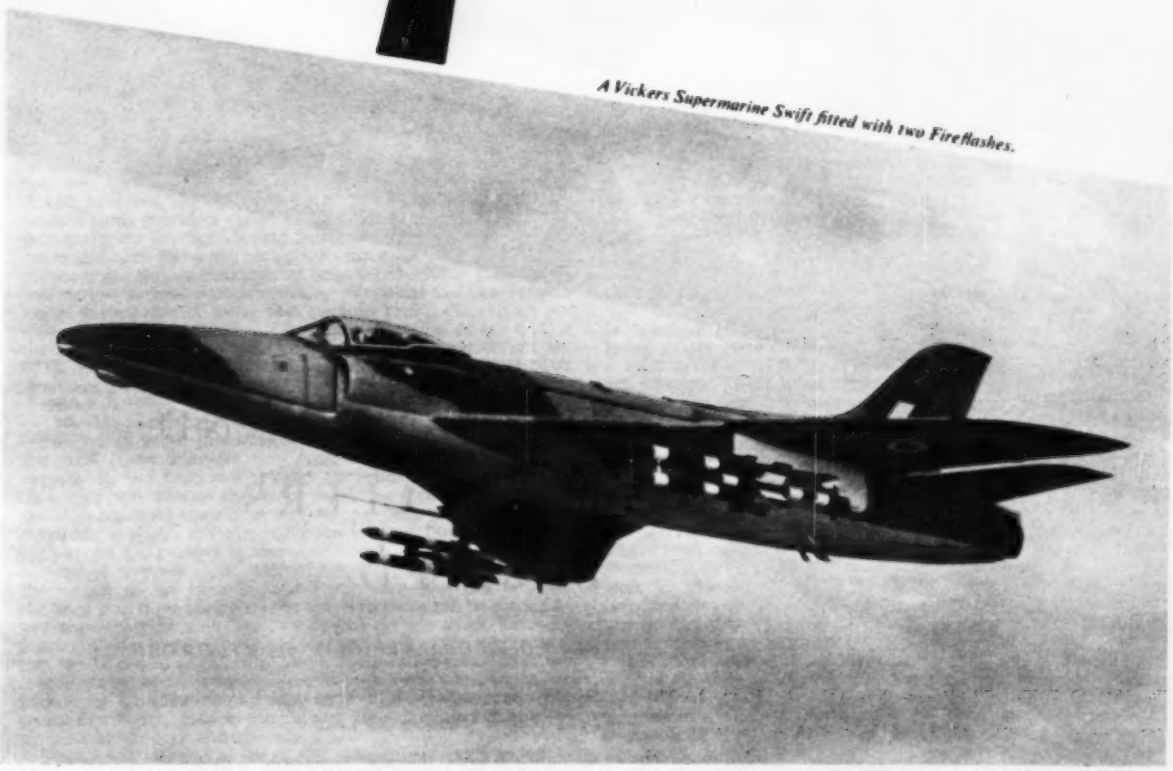

A Vickers Supermarine Swift fitted with two Fireflashes.

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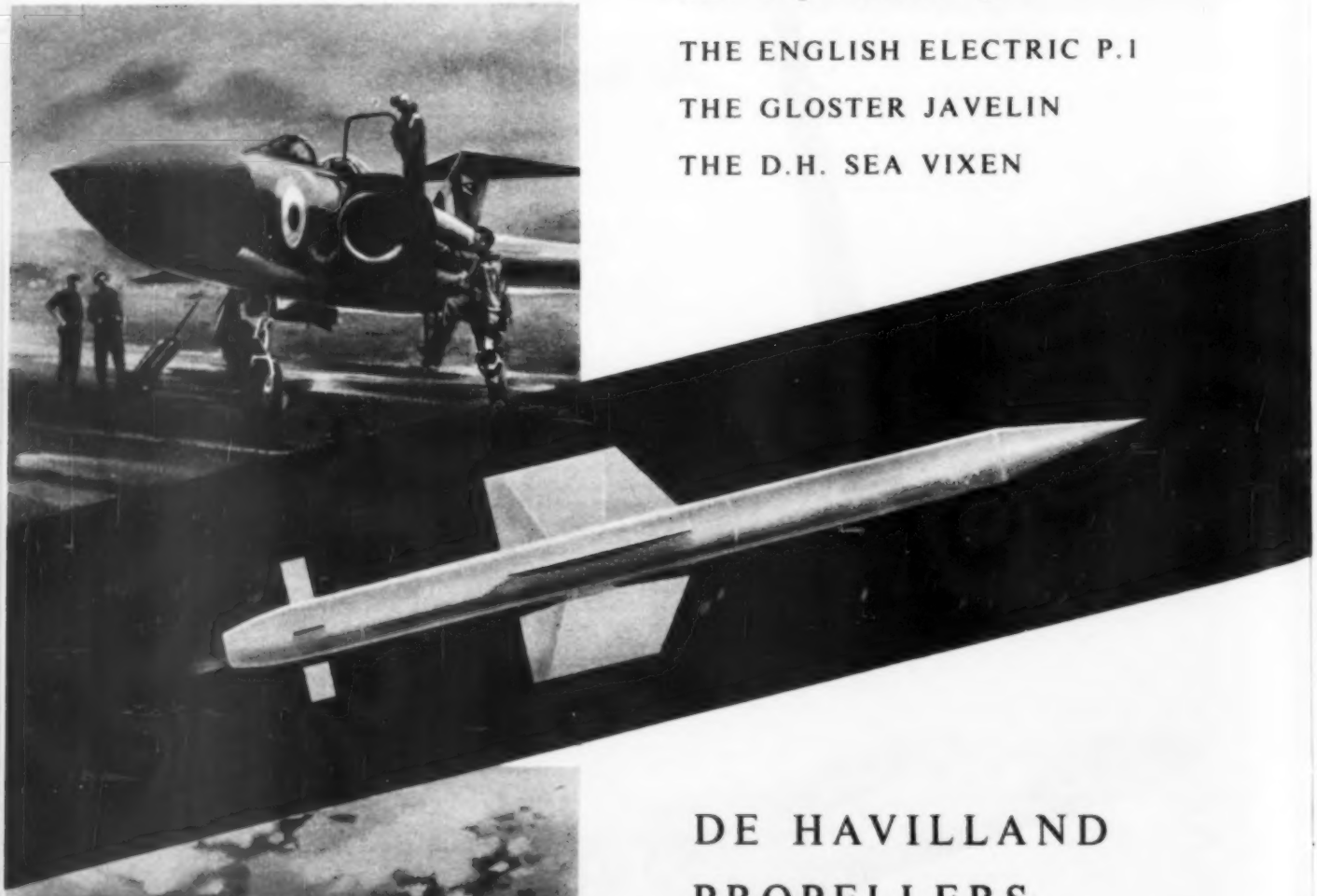

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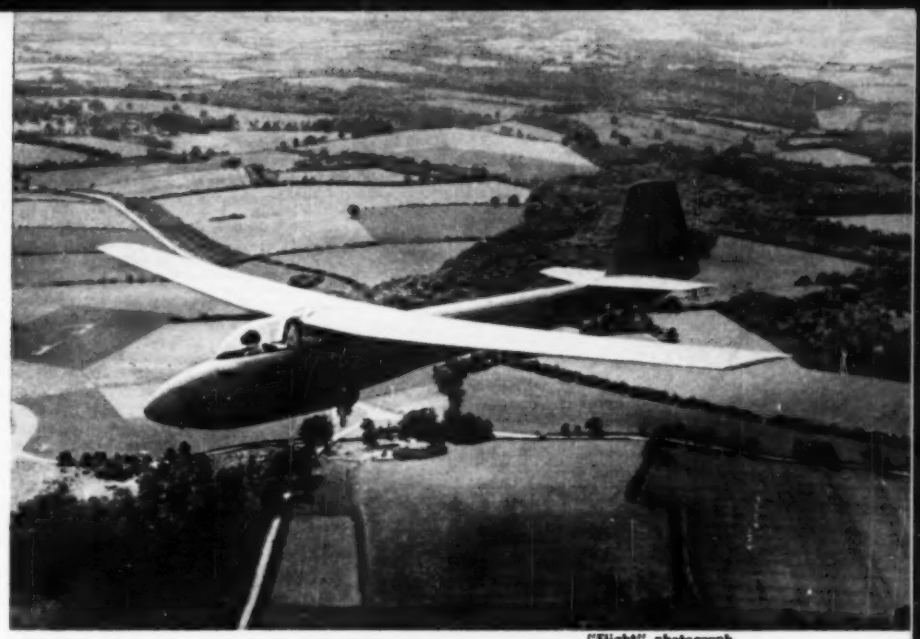
SLINGSBY T.42B EAGLE

WORLD CHAMPION TWO-SEATER FROM THE PILOT'S VIEWPOINT

By CDR. H. C. N. GOODHART, R.N.



"Flight" photograph

THE author of this article, with Frank Foster as second pilot, flew the Slingsby Eagle into first place at the 1956 World Gliding Championships at St. Yan. On these pages he describes his impressions of the type.

FOR many months after its first appearance, there was no official name for the Slingsby T.42B two-seater sailplane. The first prototype had been christened *Eagle* by its owners and there followed a tendency to give the nickname *Beagle* to the B-version, but this did not stick and, later, the first name was formally adopted. The somewhat derisory title of *Boîte-à-sardines*, which the machine earned on first sight at St. Yan, did not stick either; this friendly derision changed quickly to a healthy respect as the T.42B began to show that, whatever she might look like, her sturdy Yorkshire ancestry had bred in her a performance quite out of keeping with her appearance.

The Eagle is not a beautiful machine and yet it is logical and functional. If you take two men and try to build a low-drag fuselage around them you obviously put them one behind the other; but then you find that, to get the c.g. in the right place, one of them is in the middle of the wing and cannot see a thing. Since the T.42B is designed as a high-performance trainer it is obvious that both pilots must be able to see, so Slingsby has compromised by overlapping the two pilots with the feet of the rear one outside the seat of the front one; hence the very characteristic "hard chine" appearance of the fuselage. It is just as simple as that, and it's cheap too, but not beautiful. In this way the head of the rear pilot comes just in front of the main spar whence, by judicious use of Perspex, he gets a better view than in most tandem two-seaters.

One other very big advantage accrues from this extra width. In single-seat sailplanes the width of the fuselage is decided by the pilot's shoulders and frequently this is cut to the bare minimum, leading to cramped conditions and a complete lack of any space for the inevitable bric-à-brac of cross-country flying. The T.42B, however, has cockpit space and to spare, even two roomy pockets being provided—and how one blesses this extra space after perhaps seven or eight hours' flying. Added to this is a well-contoured seat that gives support in the right places so that, on the score of comfort, the machine rates very highly. There is just one proviso to this—it must not rain. We found that in a thunderstorm the amount of water that came in round the canopy was quite incredible, so much in fact that it showed a design fault in the two pockets in the front cockpit; they were watertight and filled up. (This to the considerable detriment of passports, insurance certificates, maps and boiled sweets which were stowed therein.)

The wing plan is again not a thing of great beauty but it, too, is a logical compromise, this time between ultimate performance and low cost. Cost increases very rapidly with span so, instead of keeping to the high aspect-ratio fashionable in single-seaters, Slingsbys have carried the extra weight by increasing the chord and thus accepting some decrease in aspect-ratio. The performance reduction is slight, the cost reduction is large, but the beauty of high-aspect-ratio wings is lost.

Another enormous advantage of keeping the span down is that the weight of the wing is kept down; this, plus the fact that the wing is in three pieces, means that each piece can be carried by two reasonably fit men: add to this Slingsby's single-pin wing joints and simple wing/fuselage joint and the answer is a machine that can be rigged and unrigged with comparative ease. That this is so is proved by an occasion in the Internationals when we rushed back to the airfield for a second try after landing a few miles away on the first flight. Exactly ten minutes after the trailer stopped on the airfield we were airborne again.

Finally, the tail end of the T.42B is again eminently practical. It has good strong surfaces of lowish aspect-ratio but plenty of area for adequate control. For cheapness the outlines are all straight, in keeping with the general appearance of a rugged, dependable, workaday, practical sailplane designed not for ultimate competition performance but for the maximum amount of cheap flying by clubs and private owners.

Ultimate performance has been compromised in many ways (e.g., by using a fixed wheel) and yet it is surprising how small is the performance difference between the Eagle and the super-refined competition jobs (with the super-refined prices). The T.42B is reputed to have a maximum gliding ratio of 31 compared, for example, with the Breguet 904's ratio of 37. It looks a dreadfully big difference; but consider it another way, assuming that we set off side by side with the Breguet 904 for the next thermal six miles away. We lose 1,000ft in this process while he loses 840ft. Our minimum speed is lower than his, however, so that we can get nearer the core of the thermal, and also we have a slightly lower minimum sinking speed (120 ft/min as compared with 128 ft/min), so perhaps we will achieve say 250 ft/min rate of climb while he achieves 210 ft/min and, to our surprise and pleasure, we find ourselves once more side by side with him as we leave this thermal and press on to the next.

On the last glide of the day, of course, his superior ratio will pay off when, from, say 6,000ft, he can glide over six miles farther than us, and also there may be gaps between thermals which we cannot cross but he just can. On the other hand, there may be very narrow thermals or areas of very weak lift in which he just can't climb and we just can, so let us in no way underrate the performance of the Eagle.

Given very strong, large thermals there is no doubt that the Slingsby two-seater would be left at the post by the super competition machines, but we do not have these dream thermals in this country, nor indeed did we have them at St. Yan. The T.42B is designed for maximum soaring in a year and so it still keeps going under poor conditions.

Now to the actual flying of the machine, where we find the same story again. There is no finesse about the controls, none of that "thumb and forefinger only on the stick" stuff, and no flying in socks or in gym shoes for greater sensitivity. No, the controls are not light and there is appreciable friction, but they are effective and the stick-forces are not excessive. Harmony of the controls is adequate and the rate of roll is adequate for a two-seater (4.5 sec. from 45 deg to 45 deg).

Prior to being taken out to St. Yan the machine had been put through the complete B.G.A. test programme by Test Group No. 1. These tests only finished the week before departure and Frank Foster and I therefore had no chance to fly the machine until we were in France. This was not such a problem as might be imagined for, having completed the test programme, the machine was devoid of any unpleasant characteristics, and could be flown with complete confidence under all conditions.

The French Stampe tugs were excellent but, even allowing for their performance, one could feel that the Eagle is comfortable on take-off and tow. At the take-off, aileron effectiveness is picked up pleasantly early and the machine flies off with no change of trim at about 40 kt. During the climb the view forward is good but, owing to the wide cockpit, downward view is poor. This feature was very noticeable when trying to cross the starting line

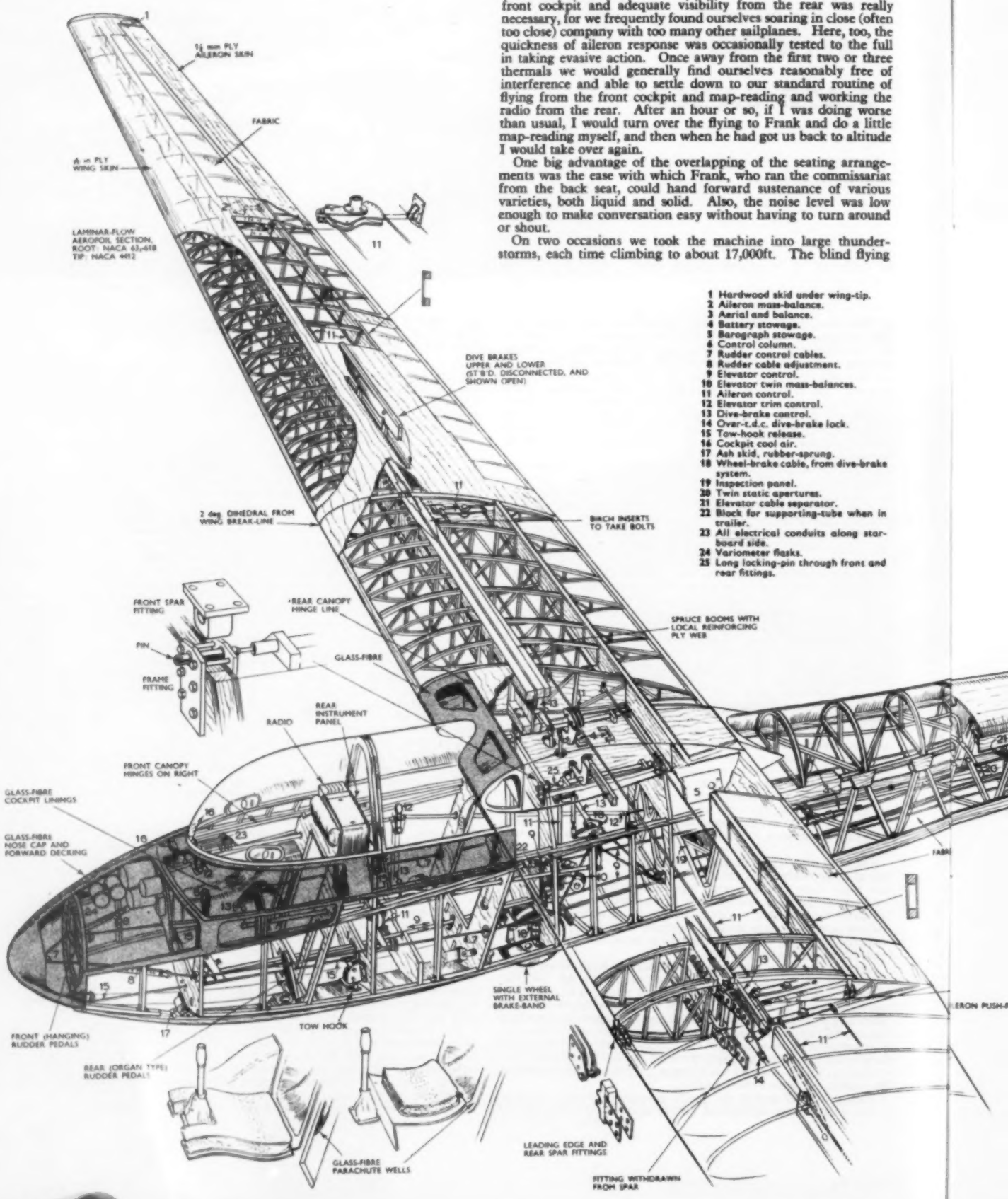
SLINGSBY T.42B EAGLE . . .

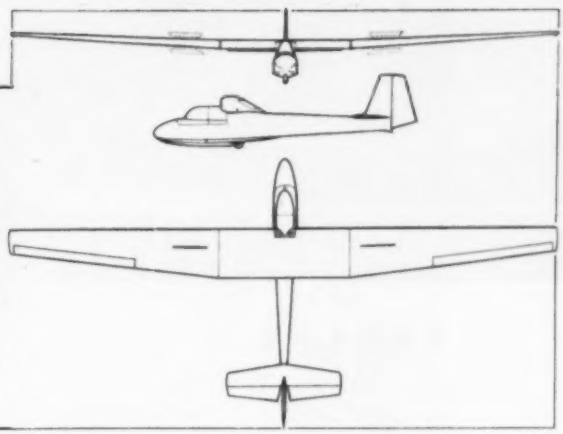
—which was only 300 metres long—at St. Yan; I found that neither end could be seen at all and consequently one had to guess when one was over it.

It was immediately after release that the good visibility from the front cockpit and adequate visibility from the rear was really necessary, for we frequently found ourselves soaring in close (often too close) company with too many other sailplanes. Here, too, the quickness of aileron response was occasionally tested to the full in taking evasive action. Once away from the first two or three thermals we would generally find ourselves reasonably free of interference and able to settle down to our standard routine of flying from the front cockpit and map-reading and working the radio from the rear. After an hour or so, if I was doing worse than usual, I would turn over the flying to Frank and do a little map-reading myself, and then when he had got us back to altitude I would take over again.

One big advantage of the overlapping of the seating arrangements was the ease with which Frank, who ran the commissariat from the back seat, could hand forward sustenance of various varieties, both liquid and solid. Also, the noise level was low enough to make conversation easy without having to turn around or shout.

On two occasions we took the machine into large thunderstorms, each time climbing to about 17,000ft. The blind flying


1 Hardwood skid under wing-tip.
2 Aileron mass-balance.
3 Aerial and balance.
4 Battery stowage.
5 Barograph stowage.
6 Control column.
7 Rudder control cables.
8 Rudder cable adjustment.
9 Elevator control.
10 Elevator twin mass-balances.
11 Aileron control.
12 Elevator trim control.
13 Dive-brake control.
14 Over-t.d.c. dive-brake lock.
15 Tow-hook release.
16 Cockpit cool air.
17 Ash skid, rubber-sprung.
18 Wheel-brake cable, from dive-brake system.
19 Inspection panel.
20 Twin static apertures.
21 Elevator cable separator.
22 Block for supporting tube when in trailer.
23 All electrical conduits along starboard side.
24 Variometer flasks.
25 Long locking-pin through front and rear fittings.
1¼ mm PLY AILERON SKIN
FABRIC
⅛ in PLY WING SKIN
LAMINAR-FLOW AEROFOIL SECTION. ROOT: NACA 63,-618 TIP: NACA 4412
DIVE BRAKES UPPER AND LOWER (ST'B'D. DISCONNECTED, AND SHOWN OPEN)
2 deg DIHEDRAL FROM WING BREAK-LINE
BIRCH INSERTS TO TAKE BOLTS
FRONT SPAR FITTING
PIN
FRAME FITTING
REAR CANOPY HINGE LINE
GLASS-FIBRE
SPRUCE BOOMS WITH LOCAL REINFORCING PLY WEB
REAR INSTRUMENT PANEL
RADIO
FRONT CANOPY HINGES ON RIGHT
GLASS-FIBRE COCKPIT LININGS
GLASS-FIBRE NOSE CAP AND FORWARD DECKING
SINGLE WHEEL WITH EXTERNAL BRAKE-BAND
TOW HOOK
FRONT (HANGING) RUDDER PEDALS
REAR (ORGAN TYPE) RUDDER PEDALS
GLASS-FIBRE PARACHUTE WELLS
LEADING EDGE AND REAR SPAR FITTINGS
FITTING WITHDRAWN FROM SPAR



STRUCTURE: MODIFICATIONS: DIMENSIONS

THE "Flight" cut-away drawing on these two pages, and the three-view G.A., show the production version of the Eagle. The aircraft flown by Cdr. Goodhart at St. Yan, and illustrated in the heading photograph to this article, is the second prototype machine, now based (as is the first prototype, which first flew on June 12, 1954) at Lasham.

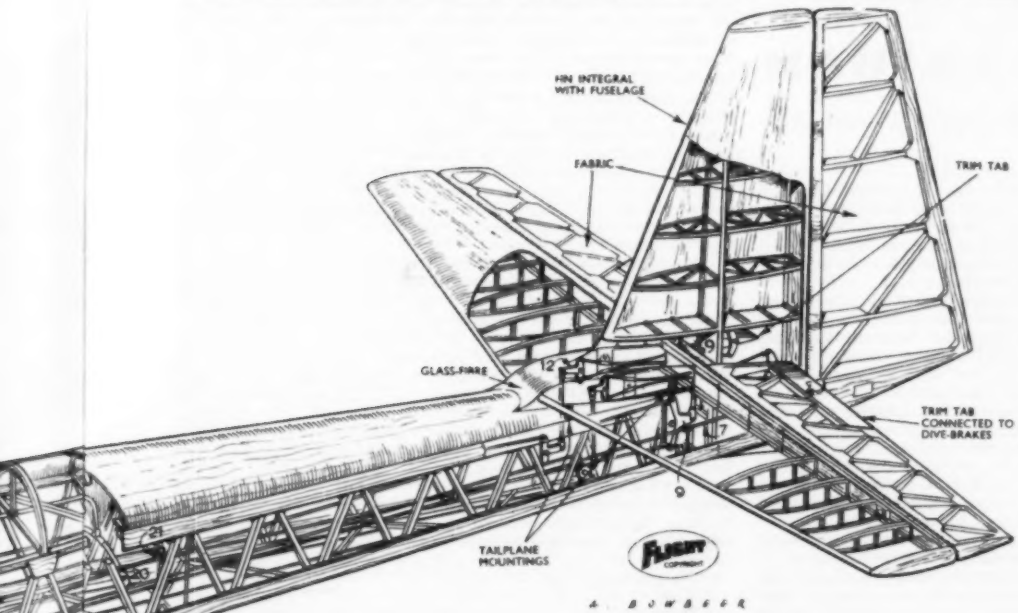
The Eagle airframe is of wood, with spruce structural members and plywood skins and webs. The use of laminated plastics in a number of components is indicated in the drawing. The fuselage is built as one assembly, with an integral ply-covered fin. The wing is attached to the fuselage by two main-spar and two rear fittings, and the tailplane by four fittings forward of the fin front-spar. The three-piece wing incorporates I-section main spars with spruce booms and birch plywood webs.

The following are the main modifications which have been incorporated on production aircraft. The front portion of the fuselage has been extended, forward of the main bulkhead, by 15 cm (6in). The area of the dive-brake panels has been increased by about 10 per cent, without changing the position of the dive-brake lever arms. A second elevator trim-tab, connected to the dive-brake mechanism, has been added to counteract the change of trim previously associated with the sudden application of the dive brakes at high speeds.

The main dimensions and weights of the T.42B Eagle are as follows: span, 58ft 5in; length, 27ft 7in; height, 6ft 1in; gross wing area, 229 sq ft; aspect ratio, 14.8; empty weight, 780 lb; flying weight, 1,200 lb; wing loading, 5.25 lb/sq ft; glide ratio, 29-31 at 50 m.p.h.; sinking speed, 2ft/sec at 48.5 m.p.h.; maximum speed, 146 m.p.h.; wing profile, NACA 63_3-618 (root), NACA 4412 (tip).

proved very easy and straightforward, and it was here that the strong fore-and-aft stability of the machine, both stick-fixed and stick-free, was a considerable help in maintaining smooth and steady circles. I noticed that Frank Foster, flying from the back seat on a turn-and-bank only, was able to fly extremely smoothly —but perhaps that should be attributed as much to his being a B.E.A. pilot as to the docility of the T.42B.

During one of the thunderstorm climbs, the nose pitot iced up (or filled with water), causing the A.S.I. to stop functioning; I had an artificial horizon in the front cockpit, however, so this was not too serious. One other difficulty which did show up in the thunderstorm flying was hail damage. A few small tears that occurred in the fabric of fuselage and tail were probably due to ice breaking-off from the wing, but damage by hail to the wing leading-edge was more serious; it consisted of a rash of small dents which, we felt, must have a serious effect on the performance of a laminar-flow wing. It is understood that Slingsbys have now produced a harder leading-edge covering to prevent this trouble in the future.



The laminar-flow wing requires the adoption of an appreciably different circling technique compared with flying in machines with the older non-laminar wing sections. With these older sections it was advantageous to fly as near to the stall as possible and, in a small, turbulent thermal, one expected to stall momentarily now and again. With the laminar section on the Eagle however, the drag begins to build up rapidly three or four knots above the stall and it is necessary to keep out of this range if one is to avoid high rates of sink. We found that the minimum circling speed was about 40 kt, which gives rather a large circle.

I think that this factor contributed more than anything else to the lower performance of the two-seaters at St. Yan, where the diameter of the strong core of the thermals was often too narrow for circling. In the older machines it was always easy to circle at the right speed regardless of angle of bank, as one knew that one should be right up on the verge of the stall whereas, in laminar-flow machines, it is more difficult to be sure that one has the correct speed for minimum sink as, normally, the only indication is a build-up in the rate of sink if one goes too slowly. The T.42B solves this problem by having a burble that breaks away from the canopy at just about the right speed. Of course there should not be a burble, but at least this is a useful one. In the absence of a convenient burble, should one perhaps fit an angle-of-attack indicator?

The strong fore-and-aft stability characteristics mentioned earlier as an advantage in thunderstorm flying are, in my own view, excessive and a nuisance in ordinary cross-country flying, when one seldom continues in one condition of flight for more than a fraction of a minute at a time. Any change, such as from circling to slow cruise or from slow cruise to fast cruise, requires stick forces which are too heavy to hold and must be trimmed out; one is therefore virtually flying on the trimmer. I would much prefer to have only slightly positive static stability and a low stick-force of perhaps 5-8 lb per g. After all, one can always turn on a few more nerves in the occasional turbulent cloud. Unlike a power-driven aeroplane, a sailplane is continually being manœuvred and its stability is in direct opposition to its ease of manœuvre. In all fairness it must be mentioned that I inevitably fly near the forward c.g. limit (owing to a small matter of avoirdupois).

The landing characteristics of the Eagle are an excellent feature of the machine. The air-brakes are designed to limit the speed to 120 kt (max. permissible I.A.S.) in a vertical dive and are consequently extremely powerful; this power is invaluable in landing, making it possible to get into very small fields over awkward obstructions. There is a brake on the landing wheel to ensure short landing-runs; without the use of the brake the landing-run is very long. During the course of the competition at St. Yan, in our efforts to achieve maximum possible marks, we several times stretched our glide beyond the prudent limit and ended up in some very difficult fields of entirely inadequate size. On two occasions we tested the ruggedness of the machine to the maximum. The first time, in a very rough field, it was necessary to ground-loop smartly in order to avoid the far fence. The second time (the last landing of the contest) we ended up in a corn field—a type of landing that is frequently fatal to sailplanes. In neither case was there any damage whatever.

The foregoing covers the salient points that impressed me during 40 hours' flying at St. Yan and are strictly from the point of view of competition flying. The machine is only now coming into regular use for its real function of high-performance soaring training, but I am sure that it will acquit itself as excellently in this, its designed function, as it did at St. Yan.

TERLET . . .

. . . AND LASHAM

DUTCH AND BRITISH GLIDING CENTRES COMPARED

THE forthcoming National Gliding Championships, the biggest ever held in this country and, possibly, in the world, have again focused attention on the Lasham Gliding Centre in Hampshire. It is interesting to compare Lasham with Terlet, its counterpart in the Netherlands, and, indeed, to compare the British contest with the recent Dutch nationals.

The Lasham Gliding Centre is an amalgamated unit of seven clubs. No Government subsidy other than a petrol rebate is enjoyed, and all revenue is derived from the members and from weekly courses for non-members which are run throughout the year. Terlet, near Arnhem, is the National Gliding Centre of the Netherlands, and last year received a subsidy of approximately £17,000. During 1956, the permanent staff at Lasham consisted of two flying instructors, one glider maintenance engineer, one motor mechanic, one tow-car driver, two administration staff and one bar steward (a total of eight). Employed at Terlet were one director, four instructors, three admin. staff, ten glider repair and maintenance engineers, one winch driver and two motor mechanics (together totalling 21).

It should be remembered that, in this country, most of the work in gliding clubs is done by the members themselves in order to minimize cost. On the Continent, however, most countries enjoy a gliding subsidy and large permanent staffs are retained. The following figures, although not put forward as proving that Lasham is more efficient than Terlet, make interesting reading:—

RESULTS FOR 1956

	Launches	Hours	Monies received
Terlet	10,217	1,905	£17,000 (subsidy)
Lasham	20,808	3,350	£10,000 (members' subscriptions, flying fees, etc.)

Terlet's fleet	Lasham's fleet
2 Govier (German two-seaters)	3 Slingsby T.21 (two-seaters)
2 Rhonlerche (German two-seaters)	1 Slingsby T.42 (two-seater)
4 Grunau Baby	1 Weihe
2 Skylark 2s	4 Skylark 2s
2 Skylark 3s	4 Eon Olympias
2 Sky	2 Tiger Moths
2 Fokker Olympias	
1 Tiger Moth	

There are no privately owned gliders at Terlet, whereas Lasham has 18. If a comparison were to be made, it would appear that Terlet and Lasham are about the same in efficiency if the private-owner fleet is costed into the main figure. But there the comparison ends, for Lasham and Terlet have fundamentally different primary functions. The biggest club of the Lasham Group is Surrey G.C., which is open to all; the members are not subsidized and they fly because they like flying. This also applies to the Crown Agents Club, B.B.C. Club, and B.E.A. Club, although these are respectively restricted in membership. The Imperial College G.C. not only offers flying to students but goes further by giving "educational" flying instruction to aeronautical engineering students as part of their university studies. The Army Club is open to Army personnel but also gives gliding tuition to cadets of the Royal Military Academy, Sandhurst, so that they may obtain a rudimentary appreciation of flight and its problems. Lasham therefore provides gliding for interested men and women plus some "educational" gliding for selected pupils.

Terlet, on the other hand, is primarily a training establishment for carefully selected boys, with some additional gliding for interested men and women. In Britain, it would appear that official circles do not realize the value of gliding in this air-faring age. Apart from the Air Training Corps gliding effort, little or no help is given to the British gliding movement. In Holland it is quite different. This small but extremely intelligent and active nation has always been in the forefront of aviation, and their national airline, unlike ours, has realized the potentialities of gliding in aircrew training. Gliding in Holland is more than a sport enjoyed by ordinary people; it is a means of pre-selection for Dutch airline and Service pilots of tomorrow.

The Royal Netherlands Aero Club was granted 420,000 guilders (approximately £40,000) for gliding during 1956. This was divided between the Terlet Centre and 34 affiliated clubs. The administration of the fleet of 99 gliders which are allocated to the centre and clubs is carried out from Terlet. Boys between the ages of 15 and 18 who are medically fit are given free *ab initio* training, and the best pupils who show an interest in a flying career are given advanced training. They continue gliding for as long as possible and are closely watched by their instructors, who assess their suitability for aircrew training. This gliding tuition is carried out largely by the clubs, thus leaving the centre to concentrate on the training of instructors, and on high-performance soaring and blind-flying tuition. The clubs and the centre are open to the general public who, of course, have to pay for their gliding.

The Championships. The Dutch National Championships were unique: never before, anywhere in the world, had pilots competing for the title of national champion been restricted to gliders designed and built in Britain. Fourteen Slingsby Skylark 2s were the chosen sailplanes and a very impressive sight they were. This state of affairs in a highly competitive market does Fred Slingsby great credit and is surely an outstanding achievement in the history of the British aviation industry. Of the 21 gliders entered, 16 were products of his company.

The open class included a Breguet 901 flown by the French champion Lacheny, one Skylark 3, one Sky, 3 Fokker Olympias and a pre-war Dutch designed V-20. Those pilots who wished to be considered for the national team for the 1958 World Championships, or those competing for the title, flew the Skylark 2s. The Championships were won by Lacheny but the title of Dutch champion went to Toutenhoofd, a twenty-two-year-old student who holds Holland's only Diamond "C," and who distinguished himself in the 1956 World Championships at St. Yan. Luckily, the day which has become a gliding legend in Europe—Monday, May 27—coincided with this year's Dutch contests and on this day 6,000 km were flown from Terlet. Lacheny covered 764 km at 75 m.p.h. to set up a new French record. This is the third longest flight completed in the world and the longest in North-west Europe. Toutenhoofd covered 561 km and nine other pilots flew over 300 km. The final order of the first five was:—

Lacheny	Breguet 901	7,498 pts.
Toutenhoofd	Skylark 2	7,195 ,,
Kaay	Sky	6,261 ,,
Koch	Skylark 2	5,611 ,,
de Boer	Skylark 2	5,541 ,,

In view of this performance at that time of year, the question arises as to whether, in future, the British Nationals should not be held at, say, the end of May. The weather seems to be kinder then, the roads are emptier and the crops lower. It also means that if you are lucky enough to get another week's holiday, you can still take the family to the seaside.

The forthcoming British Nationals are interesting not only because of the new league system which divides the men from the boys, but also the large number of Skylark 3s entered in the top league. Although the Olympias are still numerically the largest group—three in League 1 and 17 in League 2, the Skylarks are not far behind. There are nine Skylark 3s and six Skylark 2s in League 1 and eight Skylark 2s in League 2. For the first time in National Championships, the top seeded pilots are almost all flying the same type of glider. Out of the top seven pilots, five are in Skylark 3s. Philip Wills, the former world single-seater champion, will be fighting to retain his title of National Champion. This year he intends using a new "secret weapon"—an electrically operated super-sensitive variometer designed by Harry Cook, the inventor of the Cook compass.

Whatever the result of the contest, and the struggle this year will be really tough at the top, it is certain that the gliding movement in Britain has never been healthier. W. A. H. K.

A DAY WITH THE P.1

By KENNETH OWEN

"FLIGHT" PHOTOGRAPHS By IAN MACDONALD

SHORTLY before nine o'clock each morning, at the airfield at Warton, Lancashire, which English Electric rent from the Air Ministry, a number of men converge on the conference room at one end of the admin. block which overlooks the main gate. Pilots, flight-test engineers, instrumentation engineers, design engineers, maintenance heads and other specialists. Their common interest is the company's P.1 aircraft and its progress. At nine o'clock the chief engineer leaves his office, walks a few yards along the corridor and enters the conference room. In informal fashion he takes the chair, and asks for the serviceability state of the aircraft. The daily P.1 meeting has begun.

The morning meeting, and the events of the day which follow, give a good picture of the combined operation that is the flight-test programme of the P.1. It is a most interesting operation—for the method of development of this machine is different from any other British military aircraft—and one which, with appropriate respect for official "security," is well worth describing.

The background to the daily routine, and the technical features of the machine, were described in the P.1 progress report by this journal's Technical Editor in *Flight* of April 26, shortly after the first flight of the first P.1B. At that time a full exploration of the basic flight envelope of the Sapphire-powered P.1A had been completed, on WG 760 and WG 763, the first two prototypes. These two machines had then logged over 500 flights.

The emphasis has now turned to the Avon-powered P.1B, and in particular to XA 847, the first of three prototypes which are to precede the pre-production batch of 20. Over 600 flights have now been made by the three aircraft, and the first phase of P.1B flight-testing is now complete.

At the beginning of the flight-test programme on the prototype P.1B, the aerodynamics of the type were well known, as it possessed wings and horizontal tail surfaces identical to those of the earlier P.1s. Changes to the fuselage, and in particular to the cockpit and the nose intake, had been made, however, and higher Mach numbers and altitudes were to be explored.

After some 40 flights, XA 847 had shown no handling problems, and the way was clear to go forward with the precise measurement of its performance. One of the preliminaries to this was to establish the position error of the pilot's airspeed and altitude presentation, and it was at this stage that we visited Warton, a few weeks ago, to spend a day with the P.1.

And, as mentioned in the opening paragraph, a day with the P.1 begins for a number of people at the nine o'clock meeting. For the aircraft itself, the day began earlier, with its roll-out from the hangar and its daily engine-runs in the hands of Rolls-Royce engineers. Sometime during the conference-room meeting, the sound-screened telephone on the wall rings, a quiet maintenance engineer takes the call and reports with a nod to the meeting that XA 847 is serviceable and ready.

The day's programme is already known in outline to the test pilots and to the flight-test engineers—and indeed to all others concerned in the work. A number of low-level p.e. runs are to be made that day, some along the runway with observation from the old Warton control tower, and some along the coast off Blackpool, with observation from the famed Blackpool Tower. The Blackpool runs are to include those at the high end of the subsonic range.

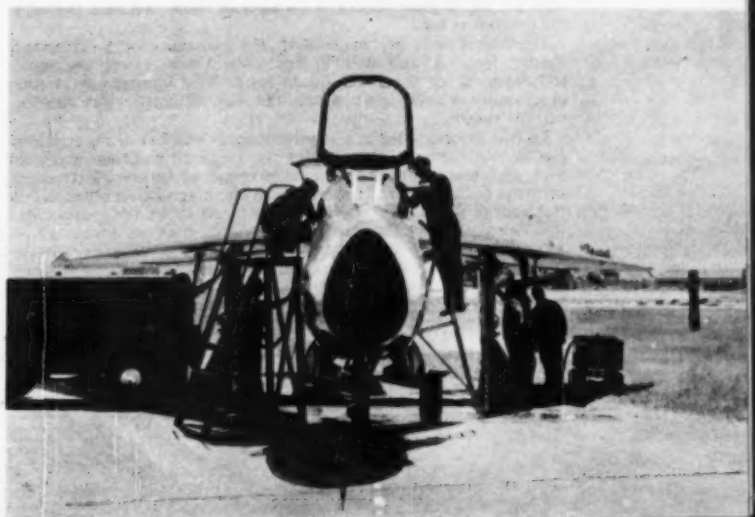
With little waste of time, details are swiftly arranged. The number of flights, number of runs per flight, time of the Blackpool runs, and other incidental points which are to be checked by the pilot. A slight malfunctioning of the cockpit air-conditioning was reported the previous day; the engineers believe it is now cured; it is to be checked on the first flight, which is also to feature in-flight flutter checks.

Also on the day's programme are several flights by WG 763, the second P.1A, which later in the week is to be handed over to the A.I.D. and then flown to R.A.E. Bedford for further flight trials there. One flight involves a number of radar-controlled runs over the Aberporth range, South Wales.

The P.1B's low-level p.e. runs are to be followed the next day by high-level, high-speed runs in which a calibrated Venom from A. and A.E.E., Boscombe Down, will act as "pacer." The meeting decides when the Venom will probably be needed, and arranges for Boscombe—and also the radar ground station which will control the P.1's runs—to be notified.

By 9.15 the meeting is over, and we accompany Roland Beamont, manager of flight operations and chief test pilot, back to the smart new flight operations block alongside the hangars. Much of our time is to be spent here today, for it is an appropriate place to see much of the direct effort that goes into the P.1 development programme. The building accommodates both Flight Operations and Flight Test—literally a concrete example of the teamwork on which the programme is built. Beamont himself was to do much of the flying that day, although all members of the English Electric team of test pilots have participated in the P.1 programme to date.

On the far side of the main runway, the two glistening tubes that are WG 763 and XA 847 are centres of attention as, surrounded by ladders, trucks, tankers and ground-crew, they are groomed for flight. The elegance of a suitcase, perhaps; nevertheless, these mean and ugly slabs of aircraft defy descriptive comparison. Other aeroplanes are at least reminiscent of various other



After being towed out of its Warton hangar (heading picture), WG 763 has its pre-flight grooming (right). The day's flying is soon to begin.

A DAY WITH THE P.1 . . .

things but, to the present writer at least, a P.1 is a P.1, and is unlike anything else on earth.

Beamont dons his flying kit and is driven over to the aircraft dispersal. Last-minute checks are being carried out on various parts of XA 847 as he talks briefly with the ground-crew chief. Hatches are closed, the nose intake-guard is removed, and the pilot climbs the cockpit-ladder and is assisted in strapping himself in.

No time is wasted as the steps are removed, Avons started, starter truck wheeled away and cockpit canopy lowered. The machine taxies along to the end of Warton's 3,000-yd runway, and seems poised as if gathering strength before take-off. With a deafening roar the aircraft is rolling; lifting up from the runway before the first intersection it displays a fantastic rate of initial climb. The day's flying has begun in earnest.

While the flight is taking place, we learn something of the overall test-programme on the P.1B. Test techniques and priorities are decided jointly by the aerodynamics, flight-test and instrumentation departments; one major subject in the programme to date has been the measurement of directional stability. The present position-error measurements are not in themselves exceptional—indeed, they are an example of a classical technique—but they are an essential part of the programme and, with an aircraft like the P.1, they have brought some interesting complications.

The principle is straightforward enough. The eventual object is the precise measurement of the performance of the aircraft. To obtain this an accurate determination of thrust and drag is required, in addition to a full set of film-recorded instrument readings. To establish absolute speed and absolute altitude, the aircraft's system of pressure instruments must be calibrated against a known standard, both at high and at low altitudes.

As is well known, the measurements of air pressures by the aircraft instruments are subject to interference from the pressure field around the machine. This interference is the "position error" which has to be determined.

It is assumed that the accuracy of the pitot section of the pitot-static combination is known. With the front-boom type of mounting any error would be small, and would be known from tunnel-tests at high and low speeds. The object, then, is to calibrate the static source.

This has to be done both at low and at high altitudes. Low-level calibration runs—such as those being carried out that day—involve the use of two calibrated aneroid instruments, one of which is carried in the aircraft and the other located at a raised observation point. For the majority of the runs by English Electric aircraft from Warton, the old control tower is used. The technique is for the aircraft to make a number of runs past the tower at steady speeds, simultaneous readings of the two aneroids (and the ambient air temperature) to be taken, and the data to be interpreted later with the aid of photographs of the aircraft taken as it flies past and the aneroid is read.

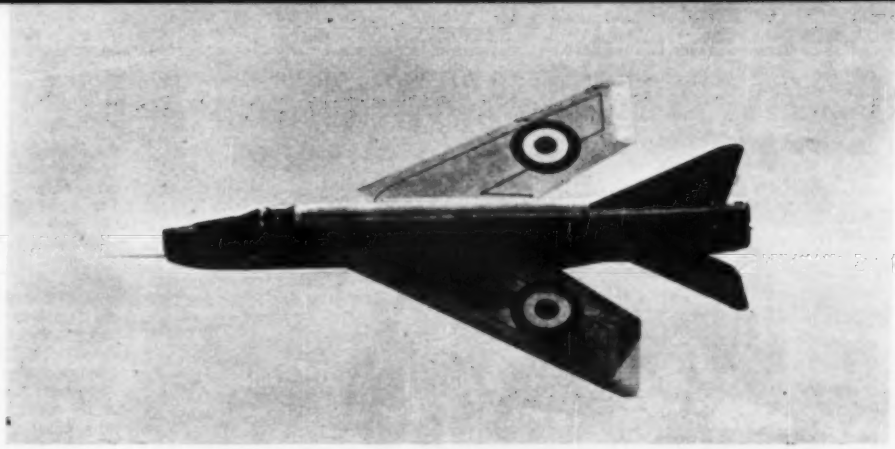
High-level runs are made with the assistance of a calibrated Venom from A. and A.E.E., Boscombe Down, using the same technique as for the low-altitude tests. The Venom acts as the observation station, past which the aircraft under test flies at various speeds.

In this manner, and in a relatively small number of flights, data can be obtained which will give the required position errors at high and low altitudes and over a range of speeds. Extremely accurate flying is called for and, with the magnificent observation platform of the Blackpool Tower just a few miles along the coast, it is not surprising the English Electric have taken advantage of a 500ft vantage point compared with the 50ft Warton airfield tower. For obvious reasons the low-level runs stop short of sonic speed, but the extra height at Blackpool clearly gives an added safety margin for the pilot at the higher subsonic speeds. Permission has accordingly been obtained for teams of test observers to set up their equipment high on the tower for specific runs, which are carried out off-shore.

In the high-level runs at the higher speeds, it is necessary for the P.1 to be directed on to the Venom by a ground radar station. At speeds up to M=1, with the Venom trailing smoke, visual contact has been found practicable without ground guidance.

The first P.1A and the first P.1B have each featured two pitot-head probes. It is reasonable to assume that a comprehensive pitot/static system is incorporated, in which one probe serves the pilot's instruments and the other the test instrumentation. In addition, there may be a pitot in the nose intake and a static vent in the skin of the fuselage—but no single position could give good results over the entire speed range. At low speeds, position error would consist mainly of the effect of incidence; at high subsonic and transonic speeds the aircraft shock-wave system would cause a large position error; while above transonic speed the probe pitot is in the free stream ahead of the aircraft bow-wave and the p.e. is not great.

Each flight, we had been told, was followed by a debriefing session at which pilot, flight-test engineers, aircraft and equipment engineers discussed the features of that flight. Expressed in this way, this seemed a commendable but possibly routine occasion, and it was only by our sitting in on an actual debriefing that its full scope and value was made apparent.



These striking photographs of the second P.1A, WG 763, show her in the hands of (left) S/L. James Dell on take-off and (right and below) Roland Beamont in flight. This machine has since moved from Warton to R.A.E., Bedford. "Security" classification at present precludes similar pictures of English Electric's P.1B.

The first notable point was the immediacy of the meeting. As the P.1 touched down and streamed its braking parachute, flight-test and other personnel concerned were already making their way to the ground floor of the flight-operations block, or were already waiting among the clusters of people and equipment at the dispersal point. After taxying in, Beamont has a brief word to the ground-crew—who, apart from unexpected snags, know exactly what was involved in the turn-round—and is driven quickly across the aerodrome to his office. Within a minute, the debriefing discussion begins, and its second outstanding quality, that of thoroughness, is made obvious.

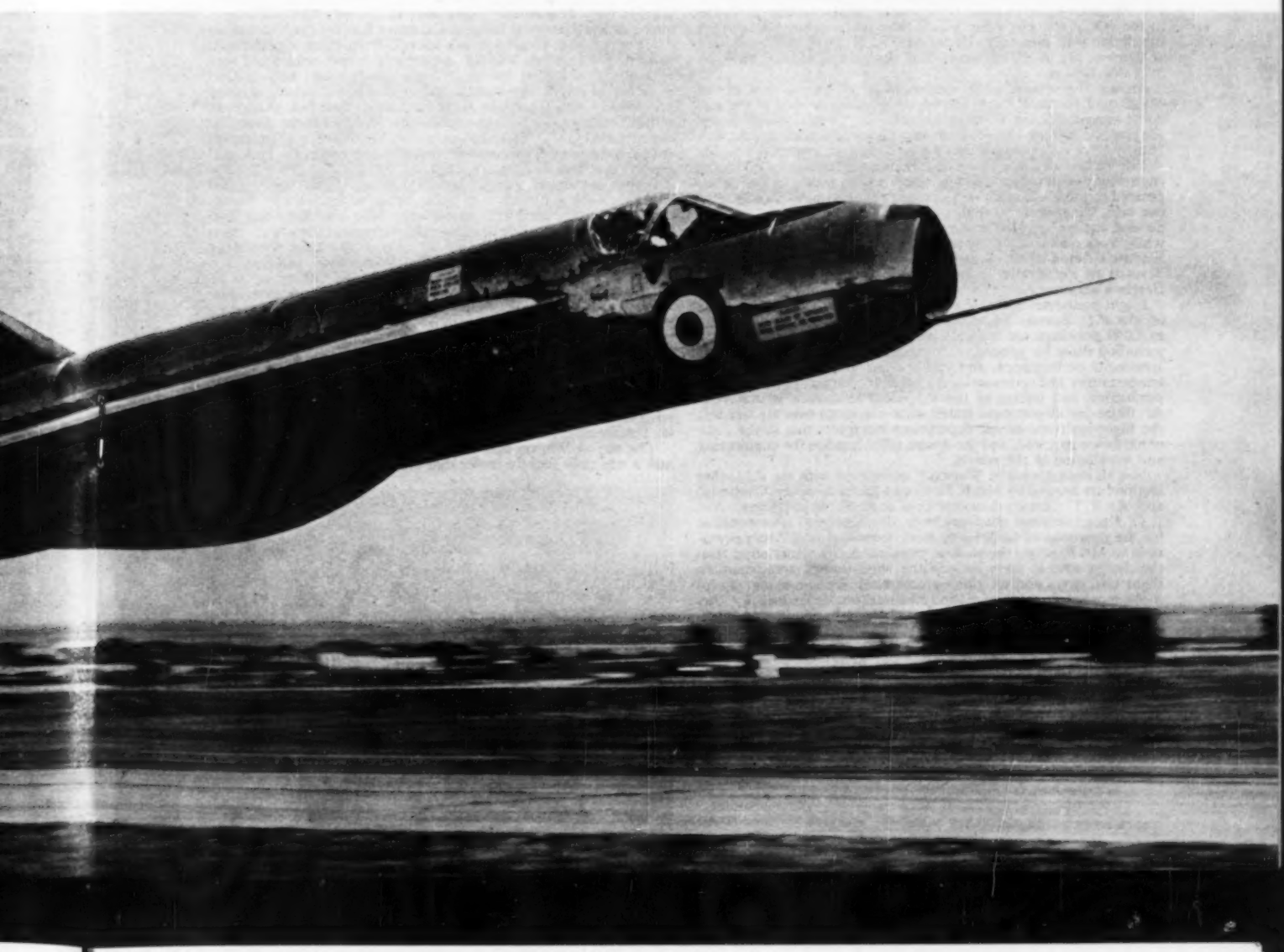
At the head of the table is Beamont, roller note pad in front of him. On his left the deputy chief aerodynamicist, whose interests extend far wider than aerodynamics alone to include every aspect of the aircraft's flight testing. Opposite him is the chief flight-test engineer; further along is a man who is in charge of the flight-test aspects of this particular P.1. The others include the superintendent of the Warton flight sheds, equipment designers (radio and electrical), design-liaison representative and aero-mechanical engineer.

The group is no larger than it needs to be. Concisely, the pilot reports his flight. First of all, was the planned programme completed satisfactorily, from his point of view, or will any of the runs need to be repeated? Question, answer and comment ensue. General agreement that the required measurements were obtained, and further agreement on the next step.

And now for snags, new and not-so-new. The cockpit conditioning system functioned well on this flight, Beamont reports; the minor malfunction encountered previously had been cured. There had been radio trouble, however, which was new (strange, one thought, that a snag new to the P.1 should be old to *Flight's* Gemini). This was being traced as they were speaking.

The discussion probes every aspect of the flight. The deputy chief aerodynamicist is intrigued by a novel piece of behaviour by a particular piece of equipment, and seeks to relate it to a possible cause. "When you throttled back, did you notice any tendency to . . . ?" "And yet when you accelerated from that speed there seemed to be . . . ?" "Hmmm. That would seem to indicate that this behaviour might not be caused by the change in Mach number, but rather might be found somewhere in the . . . ?"

This is science feeding on flight experience. It is brainpower dissecting the new phenomena of flight. To the pilots, designers and technicians at Warton it is simply the debriefing—a routine part of the flight-test programme. "How soon should the aircraft



R.A.F. Fighter Command representative at Warton, S/L. James Dell leaves the P.1A after taxying in from his Aberporth flight. The assistant flight-shed superintendent and the ground maintenance chief discuss the turn-round arrangements for the aircraft.

A DAY WITH THE P.1 . . .

be ready?" asks Beamont, as the group disperses. The P.1 flight programme has advanced another notch, with more flying time, more film records, more scientifically recorded measurements and data—and more scribbled thoughts in the notebooks of those at the debriefing.

As the day's flying programme gets under way, we visit some of the other departments at Warton, less directly (perhaps) but equally vitally concerned with the present flight-test phase of the P.1. Without a design office there would clearly have been no P.1 in the first place, but along which lines is the present activity of the design staff directed? Under Mr. F. W. Page, chief engineer at Warton, Mr. A. E. Ellison is chief designer (P.1), and he is the man who tells us.

Among the several main streams of effort on the part of the design staff on the P.1 are, briefly, the productionizing of the aircraft; various "Stage 1" modifications; the general development programme up to the end of the pre-production batch; and "Stage 2" development of the P.1 as a weapon system.

The second of these categories includes a number of airframe, engine and equipment modifications which were to be incorporated at the P.1B machine's first minor inspection (shortly after our visit, when some 50 flights had been logged). Armament and general equipment form an important part of the Stage 2 design; while work on various P.1 projects is being carried out at English Electric's Acton office. A large proportion of P.1 design effort is devoted to electrical equipment, while the problem of space is clearly a major one on this aircraft.

Flight instrumentation is a most complex and important item on the P.1. Several instrumentation systems, each involving up to 1,000 drawings, are required on the 20 pre-production aircraft, including those for general performance and handling, engine and armament performance, and engineering measurements such as temperatures and pressures. As in every aspect of the design, production and testing of the P.1, close teamwork is involved: the flight-test department states what measurements are needed; the flight-instrumentation department interprets this in the form of hardware required; and the design office handles the engineering and installation of the system.

Not all design work at Warton is concerned with the P.1; other sections are headed by Mr. F. D. Crowe (chief designer, Canberra) and Mr. R. F. Creasey (assistant chief engineer, new designs). Mr. J. C. King (assistant chief engineer, development) is responsible for the provision of facilities to meet commitments. Also responsible to Mr. Page are the various technical departments other than the design offices; these include the wind-tunnel, aerodynamics, flight-test, stress and weights, aeromechanical engineering, equipment, mould loft, mechanical and electrical test departments. Other specialist departments deal with flight/design liaison, instrumentation, electronics and photography. Among the facilities used by stress, performance and other technical sections are the DEUCE digital computer and the Warton analogue computer and flight simulator.

Typical among the technical departments in its record of early basic work and in its present development programme is the Warton wind-tunnel department. Its early predictions now being confirmed by the present flight-test programme, the department is now looking ahead with investigations into (for instance) the effect of the P.1 carrying various external stores; a special-purpose version of the aircraft; and the cambered (and kinked) wing—a long-term development which is being studied in several forms and which promises well. A particular case in which early wind-tunnel predictions have been precisely confirmed by flight-test experience is the investigation of directional stability at supersonic speeds (even at this first stage of the flight-test programme, satisfactorily positive n_v had been measured, by the stick-free Dutch roll method, up to the maximum speed so far achieved). "Security" considerations prevent *Flight* from indicating what this speed is—but not from quoting Air Marshal Sir Thomas Pike, who said earlier this year that the P.1 [the lower-powered P.1A] had exceeded 1,000 m.p.h. in level flight.

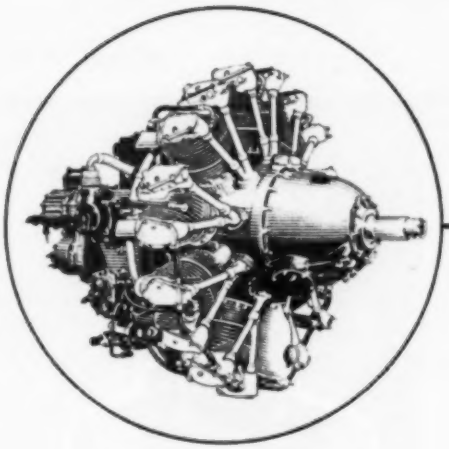
Lunchtime in the aircrew flat at Warton gave an indication of some of the other flying operations with which the aerodrome is concerned. The familiar faces of Hackett and Moneypenny, the record-breaking transatlantic Canberra team, beamed a greeting which included the incidental detail that they were off to Venezuela the next day. This journey comprised the delivery flight to Caracas of one of a repeat-order batch of Canberra B.8s for the Venezuelan Air Force. That afternoon, we learned from chief experimental test pilot "Dizzy" de Villiers (impeccably suited, with a red-rose buttonhole), a special Meteor 7 flight was laid on: he and Don Horsfield of Flight Test were to visit an R.A.F. airfield and arrange preliminary details of the radar-tracking techniques needed in connection with the high-level p.e. runs. Visitors in the mess that day included G/C. "Bruin" Purvis from Boscombe, and a pleasant young lady who, it transpired, was his test observer; both had arrived in a fierce-yellow Venom.

Flying continued that afternoon (indeed, it had not stopped while we were at lunch), with little change in the routine. Sometimes a short briefing session between pilot and flight-test men would take place while the aircraft instrumentation was being readied. After each flight, while the debriefing session was taking place, all recording equipment (including cine cameras and Hussenot recorders) in the aircraft was changed and reloaded. A quick check indicated whether the film records appeared satisfactory, or if repeat runs would be required. No time was wasted during the busy turn-rounds.

Fighter Command representative at Warton is S/L. James Dell, who was to fly P.1A WG 763 for trial runs over the Aberporth range that afternoon. At the debriefing he reported the details of his flight, including the radar-controlled pattern at the range, and the amount of trim needed to cruise hands-off. Only a few flights remained for 763 before its move from Warton to R.A.E., Bedford, for further research flying.

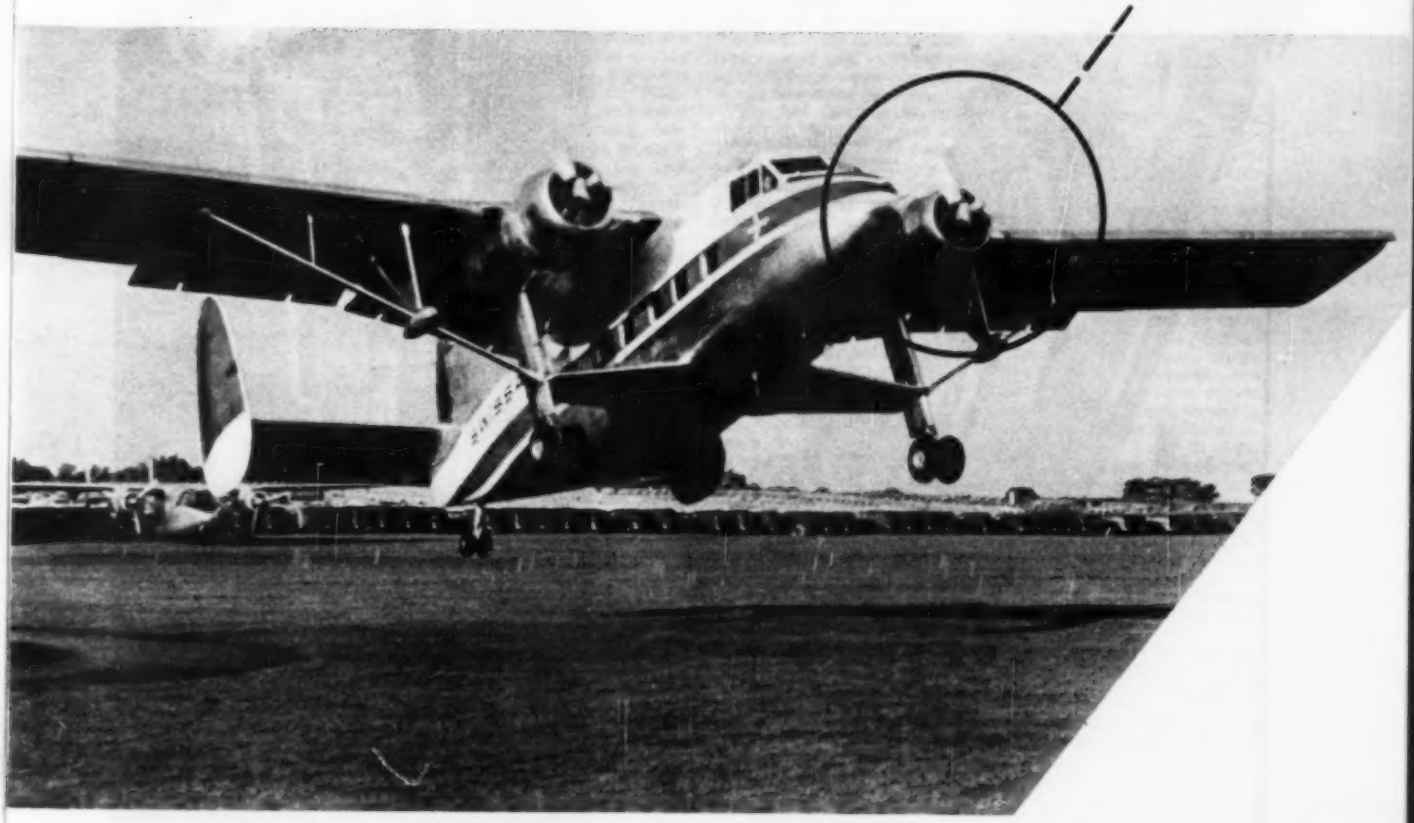
The day at Warton had been a cloudless scorcher throughout, and it was only slightly cooler that evening when the P.1B was to

"Science feeding on flight experience . . ."—a typical debriefing. From the left, clockwise: Roland Beamont, flight-operations manager and chief test pilot; A. Atkin, deputy chief aerodynamicist; D. de Villiers, chief experimental test pilot; W. Eaves, assistant flight-shed superintendent; W. Dyke, design liaison; A. M. Cundick, flight-test engineer; and D. Horsfield, chief flight-test engineer.



16 passengers take-off from a

ground run of only 100 yards



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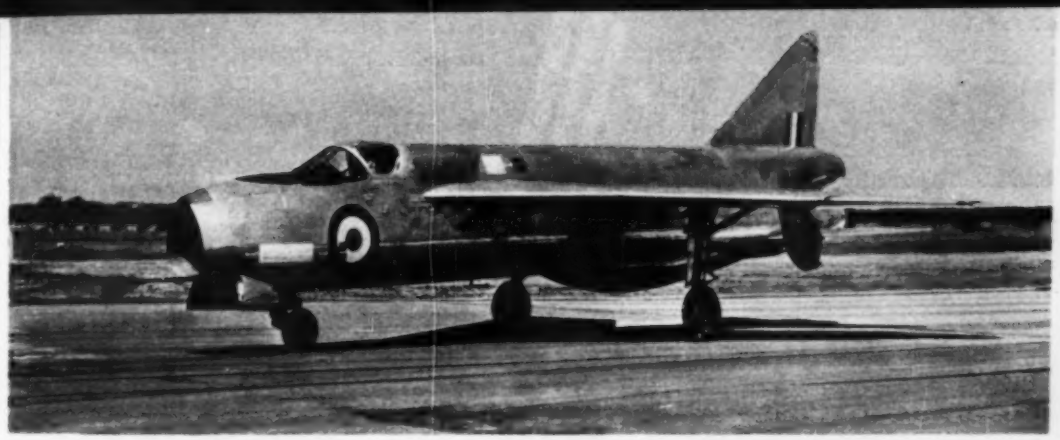

Open-mouthed in appearance, WG 763 taxies in. The ventral bulge may be a fuel tank or a fairing for a rocket motor.

make its low p.e. runs off the Blackpool shore. The team of test observers on the platform of the tower were fully prepared for the sudden, low and fast appearance by the brutish bullet of an aircraft—which is doubtless more than could be said for the holiday-makers thronging the promenade and pier.

Weather is an obviously important factor affecting the flight-test programme, and advantage has been readily taken of this summer's dry spells. The day's last landing was at about 7.30 p.m., after which work continued on the task of checking and clearing the aircraft for the following day's flying. A full night-shift is worked by the shops personnel, while instrumentation and flight-test engineers are lucky to get away much before 9.30 p.m. Films have to be developed right away, and a check kept on the general progress of the data-collection programme. The over-riding consideration is that the aircraft and its equipment should be quite ready for roll-out, engine runs and flight first thing the next morning.

This, in broad outline, is the shape of a typical day at Warton. The flight-test programme, on this day-to-day basis, is made possible by an urgent yet informal teamwork. Each fortnight, progress is reviewed at a more ambitious meeting—a complete afternoon session at which all departments, including production, are represented. The progress reviewed is not merely that of the flight-test programme, but of the many facets of research, design, production, testing and future projects—the overall development (in the widest sense) of the P.1. The minutes of these fortnightly progress meetings form instalments of an accurate life history of the aircraft. Other regular examples of wide co-ordination include Ministry of Supply progress meetings, meetings with outside suppliers (whose contribution to the P.1 as a weapon system is considerable) and production meetings at the company's plant at nearby Preston, where Mr. W. Shorrock is manager.

The chief engineer, Mr. Page, keeps in close touch with all that goes on at Warton and at Preston. At critical phases in the flight programme of key aircraft, he will himself sit in on as many debriefings as possible. He believes that there is no substitute for the direct exchange of information, flight by flight, between pilots and engineers.

In the hangars at Warton the second and third P.1Bs are taking shape. In charge of the flight sheds (which are a branch of the Preston experimental shop) is Mr. W. T. Sheldon, aircraft superintendent at Warton. The shops are concerned mainly with assembly, test, modifications and periodic inspections of the aircraft; they contain also a detailed P.1 mock-up which is kept up-to-date on all modifications.

As for the first P.1B, the main points of its initial designed-performance envelope have now been successfully cleared. In-flight flutter testing has been included (presumably the decision was taken to repeat flutter clearance on the P.1B in view of the changes in fuselage and fin structure). The control and stability qualities of the machine are largely comparable to those of the standard-wing P.1A prototypes, and in certain aspects are superior. The general handling qualities up to the highest speed so far attained, according to Beamont, are "superlative."

The "advanced-type" Avons give an impressive increase in power and are said to have improved markedly the noise and vibration levels of the aircraft. The re-shaping of the windscreen and canopy and rearrangement of the cockpit in general have improved the vision and comfort of the pilot and have eliminated the airflow noise previously encountered.

The fact that the aircraft's characteristics have corresponded closely to theoretical and wind-tunnel predictions clearly augurs well for the machine's future development. The team at Warton are certainly in no doubt as to the performance ability of the basic vehicle: the next stage will focus emphasis on the integrated P.1 weapon system. The fact that much of the equipment has been tailored to the aircraft from the start should give a useful advantage.

Over the next 18 months, the prototypes and the 20 pre-production aircraft will be based at Warton (except for specialized-test periods at establishments such as Bedford and Boscombe) and will carry out an exhaustive series of evaluation tests on the many aspects of the P.1's performance as a weapon system. Service pilots should fly the P.1B prototype later this year. Recent expansion at Warton has included a new main-runway extension, new control tower and flight operations block, extensions to the mechanical-test machine shop and the provision of radome-testing gear. For the future, new facilities planned include the construction of two supersonic wind-tunnels (one of Mach 4 and 4ft working section; and the other Mach 6 and 18in); and the provision of I.L.S., new runway lighting, and still more hangarage and design office space.

On the morning after our full day at Warton, the nine-o'clock meeting assembled as usual, with Roland Beamont deputizing for Mr. Page. The chief test pilot had apparently already received some comment from members of the public who had noticed his Blackpool flight—but, for the time being, he was primarily interested in the reactions of the team of test observers. "How did last night's runs go?"

Last night's runs, it seemed, had gone well. All the required information had been obtained, the bearded Horsfield quietly reported. The films had been checked, and appeared of reasonable quality, although the horizon was rather thick. The large young man in shirtsleeves relaxed his quizzical frown, and summed up. "It appears that that, much to our relief, completes the low p.e. runs."

(Below) Mr. F. W. Page, chief engineer of English Electric's aircraft division at Warton. (Right) WG 763, the day's flying completed, returns to the hangar (on the right is the new flight-operations block).

"Flight" photograph

Flying in the Valiant

By C. M. LAMBERT

THE mainstay of the country's whole defence system is the V-force, whose bombers would deliver the great deterrent if any attack should be made on Britain. The first type in the V-force, the Vickers Valiant, is now well established in service and its hand-picked crews have reached a high state of operational efficiency and preparedness.

Last week I was allowed to fly in Valiant XD826 of No. 7 Sqn. (W/C. A. H. C. Boxer) from Honington on a two-hour general training flight. I watched a crew operating the aircraft on a straightforward flight from Honington to a point some miles north of Glasgow and back. On returning to Honington we made, by way of demonstration, a normal touch-and-go landing, a three-engined approach and a final landing with only two of the four Avons giving power. The Valiant is evidently a superb machine and is well liked by its crews.

No. 3 Group of Bomber Command has all the Valiants and will have Victors in due course. This particular machine was captained by G/C. J. E. Grindon, the Station Commander, who is a fully qualified Valiant captain and has his own navigator and bomb-aimer. They are S/L. J. W. Abrey, Station Navigation Officer, and S/L. J. Hammond, Station Weapons Officer. For this flight I replaced the latter. Co-pilot and Air Electronics Officer were F/L. P. N. Farley and F/O. R. D. Brown.

A Valiant is an extremely valuable and potent aircraft and all crews are picked and highly trained in order to match the machine. The operating procedure is planned in the minutest detail and nothing is left to chance. Each flight, therefore, is virtually made on the ground before take-off, the airborne part of it being something of an exercise to check the accuracy of pre-flight planning. Specialist briefings are completed, the two navigators and the air electronics officer working out all the details (unfortunately unmentionable in public print), while the co-pilot calculates the fuel plan, fuel distribution and fuel sequencing routine. The c.g. is carefully watched and the fuel system is managed by the co-pilot, who also operates pressurization and powered control systems. A large book of graphs is consulted to find out the exact unstick speeds and other important values for the take-off under the particular conditions to be encountered. Each V-bomber runway is marked with a white mark, and the speed which the aircraft ought to have attained by the time it passes this point is calculated. This gives an exact check on take-off acceleration.

While this is going on the crew chief, who looks after the particular aircraft, is preparing it for flight. Some time before take-off the two pilots make a complete external check with the first of a long series of check lists. Then the crew climbs in and more checks are read out by the air electronics officer and carried out by everyone. They start with strapping in, go through every system in detail, including control functioning, and lead up to engine starting. The crew chief, with his own external intercom lead, follows through from outside. The engines started, further checks are made preparatory to taxying. Short of the runway, more checks; on the runway, still more checks; and, finally, the great surge of take-off power.

Perched on the top of the navigator-plotter's rearward-facing seat, I watched this procedure and had an excellent view of the runway from between the pilots' ejector seats. We were taking off at about 120,000 lb, the bomb bay empty and the aircraft with much less than full fuel load. The nosewheel was lifted at 80 kt, acceleration check-point speed was 110 kt and unstick speed 112 kt—a long, long way before the end of the 3,000-yd runway. At over 2,000ft/min, we climbed at 190 kt till 20 deg flap setting and wheels were cleaned up and then the climb was begun at 4,000ft/min and 275 kt, reducing to 240 kt at 30,000ft and 230 kt at 40,000—exactly. The cruise climb was begun at 43,000ft with 7,350 r.p.m. and 0.75 Mach—exactly. All the way up we checked pressure and oxygen. We wore A13-A pressure-breathing masks, but used the cruise pressure setting of 9 lb/sq in differential, giving 9,000ft cabin height at all aircraft heights above 30,000ft. Masks were therefore used only for speaking on the intercom.

The A.S.I. read 215 kt as we drifted up in the cruise; the calculated T.A.S. was 430 kt and a dial showed a groundspeed of 425 kt with two or three degrees of drift. It all seemed so effortless until I remembered the experience, training and detailed preparation which lay behind every move and thought. We knew with amazing precision where we were and where we had to go. The cabin was at just the right temperature for our shirtsleeves-and-flying-suit garb; and remained so throughout.

As we drifted up to 46,000ft the sky began to get deep blue and lightless. A shaft of brilliant sunlight illuminated part of the navigator's plotting chart, but an electric desk-lamp was needed to see the rest of it. Most light came from the cloud-layers far below. I climbed down into the bomb-aimer's visual sighting position, under a trapdoor (my oxygen pipe and intercom lead allowed me this freedom) and lay looking down at a kaleidoscope of cloud and land moving past at about eight miles a minute. Still drifting up past 47,000ft, now with an I.A.S. of 190 kt, I drank a tin of orange juice and then climbed on to the sharp edge of the navigator's seat for another look at the pilots' picture. At full arm's length I grasped the control wheel and was allowed to make a couple of 30 deg-banked turns. It was effortless and precise.

North of Glasgow we turned and headed back for base. Even with my helmet off there was only a noise as of a small rushing mountain stream and speech was clearly audible without assistance from the intercom. My back-type parachute lay, unworn but ready, on my rearward-facing seat and I was very comfortable. The whole cabin is much larger than at first appears, with the two pilots tucked away on a high shelf under the canopy. They sit on fully automatic Martin-Baker Mk 3 ejection seats. The three crew-members sit facing rearwards, side by side at a long desk surmounted by equipment racks. They wear barometrically controlled back-type parachutes and would escape by jettisoning the main entrance door and extending a blast shield to help them clear the airframe. Interior colouring is black round the pilots and drab green round the crew-members. A "combat" pressurization setting of 3 lb/sq in is used near the target.

Some 80 miles out from Honington we started the let-down, air-brakes giving a powerful decelerative tug as we went down at 220 kt, 6,000 r.p.m. and 3,000ft/min. Overhead base at 24,000ft, dead on E.T.A., we turned on to the outbound heading. Another Valiant, similarly letting down without assistance from the ground, flew on exactly our heading a few miles ahead. Turning back on to the QDM at 10,500ft we knew exactly how far we were from touchdown and, levelling off at 2,200ft we swapped airbrakes for 20 deg flap and undercarriage at 160 kt. The co-pilot calculated the c.g. with a special slide-rule and announced the aircraft weight as 90,000 lb. The standard fuel reserve is 9,000 lb which allows diversion from cruising altitude to either St. Eval or Leuchars. Steaming down the I.L.S. localizer beam with our navigator and Honington's A.C.R.7 telling us our range, we reached the final approach after some more cockpit checks. The captain called quietly for steady reductions in power, full flap and finally idling power and we settled, mainwheels first, on to the runway.

On much less than full power we got airborne again, raised the flaps with a great surge of acceleration and came round for another landing with No. 4 engine idling. There seemed nothing to it. The same quiet procedure again, the same gentle touch-down, the same effortless overshoot, with just a faint rumble to indicate the tremendous power from the engines. A final circuit with both starboard engines idling. The air electronics officer was seeing that the remaining engines gave all the electrical power needed.

The checks started again during the landing roll and continued on the way back to dispersal. For taxying we used the hand-operated brakes and tiller-steered nosewheel. Toe-pedals provide differential braking if required. Controls were locked and the hydraulic power system shut down before taxying. Finally our crew chief, Chief Technician E. T. Fletcher, received us back in the dispersal and, with more checks, the engines were shut down.

The final touch was a ride back to the aircrew centre in a bus fitted with an air-conditioning system and individual outlets for ventilated suits. A heater also would prevent crews catching cold after landing in a hot aircraft in winter. At the aircrew centre we handed in clothing for safekeeping in special drying rooms and the crew was debriefed. My two hours in a Valiant could not have been more routine; and neither could they have given me a better idea of what the V-bomber force means.

Aviation fuel meets rigid specifications when it leaves the refinery. It may travel half-way round the world before it reaches the aircraft's tanks and the journey will probably involve trans-shipment into bulk storage at the ports and onward movement by road, rail-tank cars or river barges to an airfield in the heart of a continent. At every stage of the journey from the refinery to the aircraft's tanks, Shell chemists test and retest to ensure that the fuel remains on-specification and free from all impurities.

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Radio Mailles

A French Navigation and Traffic Control System

AN important new radio navigation and traffic control system is now being actively developed by the Société Française des Télécommunications, 4 Avenue de la Marne, Asnières, Seine, France, under patents held by its director Monsieur P. C. Gaudillère. Called Radio Mailles or Radio Web, the system was briefly described on page 776 of *Flight* for June 7 after it had been exhibited at the Paris Salon. Considerable interest has been shown in the U.S.A. and in Germany; and tests of a small experimental network, centred approximately on Brétigny, are under way.

It is claimed that Radio Mailles can fulfil the three major functions of navigation, traffic control and collision avoidance; that it is entirely automatic and continuous in operation; that any radio frequency can be used, thus allowing coverage at all ranges and altitudes; that it can be simultaneously used by any number of aircraft; and that it provides position-fixing without ambiguity. The following general description shows how Radio Mailles is designed not only to give a position indication in the aircraft, but also to repeat this indication in a traffic-control centre. The relative movement and position of other aircraft in the area can also be repeated to the pilot to give him a clear picture of other aircraft in his vicinity. Finally, control messages from the ground can be sent selectively and exclusively to a single aircraft in the area without being received by other aircraft. This produces a selective calling facility which greatly lightens the pilot's task in listening-out and eases the general pressure on the radio communication channel. Since the position-fixing signals are in the form of modulations of a simple carrier signal, any frequency can be used, according to the makers' reports.

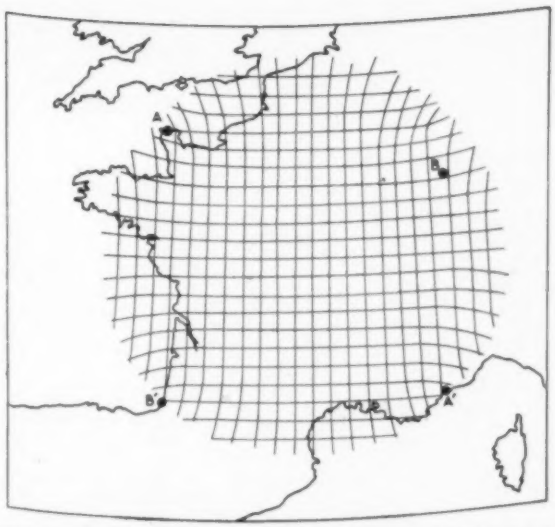
Radio Mailles is based on the physical phenomenon of travelling beats or equiphase lines. If two signals at fairly closely spaced frequencies are transmitted from two separate points, they will be received in phase coincidence at all points along a moving line, called the equiphase line. The line always takes the form of one branch of a hyperbola with foci at the transmitting stations; and the speed at which the apex of this hyperbola moves along the equiphase line is set, by the choice of frequencies, at several hundred kilometres per second. At any fixed point the equiphase signal passes at intervals of one or more seconds. If the product of the speed and timing of the equiphase signal is greater than the distance between the two transmitters, the equiphase signal will exist at only one point at any given time. Because of the values chosen for the speed and timing of the moving equiphase signal, the frequencies of the two transmitted signals will be located at a value of a few hundred cycles per second. The signals therefore consist of modulated carriers, the frequencies of which may be chosen, without any limitations, according to the particular propagation characteristics required. Thus Radio Mailles can be adapted to cover any required ranges or altitudes.

In order to provide a position-fixing service over a given area, four transmitters would be set up at the four corners of the zone. Diagonally opposed pairs would be modulated with the same frequency and, on the principle explained above, four isophase lines would be originated. A receiver in an aircraft would pick up these isophases on four channels and would measure the time between the passing of the isophases from each related pair of transmitters. The resulting position-lines would establish a fix.

If the transmitting stations are arranged at the corners of a square or rectangle, the isophase lines would cross exactly at right angles in the centre of the zone, though the lattice would be slightly "stretched" at the periphery. There are several methods of correcting this distortion. The position of the aircraft therefore could be shown with a tracer on a practically undistorted map.

For the purposes of traffic control, one of the isophase signals is arranged to trigger a return transmission as it passes over the aircraft. The exact time of this transmission is made a function of the other isophase co-ordinate so that a fix is automatically transmitted to the traffic control centre. On the display in the centre, the area is divided into a number of strips defined by numbered hyperbolæ with sources at the two transmitters which trigger the return signal from the aircraft. The position of the aircraft is defined by the number of the position-line from which it transmits its return signal and by the timing of the signal according to the other co-ordinate.

The display itself is in the form of a cathode-ray tube whose beam sweeps the tube face in a series of lines corresponding to the position of the hyperbolæ and is synchronized in time with the movement of the isophase signals used to trigger the reply signal in the aircraft. Each reply signal causes a luminous spot to appear on the screen in the location corresponding to the position of the aircraft on an undistorted map.



The second Radio Mailles network to be tried. The related pairs of transmitters have the same identification letter, that at Cherbourg being a modulation of the existing non-directional beacon.

Using these position signals in the control centre, it will be possible to establish a selective calling system. The control station will transmit a "key signal," timed to occur at the exact moment that the return signal is triggered from the aircraft. The coincidence of these two signals is detected in the aircraft and used to trigger a receiver for a given length of time. Only this one aircraft will then receive signals from the centre, leaving others undisturbed. It is thus possible to make all control transmissions on only one frequency. The selection of the aircraft to be called is controlled by adjusting a cursor over the cathode-ray tube so that its datum lies exactly over the relevant position-indicating blip.

For the purpose of collision-avoidance, each aircraft can directly receive and display the position signals of others in the area on a cathode-ray tube on which the protected aircraft is in the centre. Any other aircraft trace moving towards the centre presents a collision risk and the pilot may take appropriate evasive action. In order to avoid unnecessary evasion of aircraft which lie in a different height-band and therefore present no actual collision risk, position signals are transmitted on a frequency governed by a barometric altimeter. The receiver is controlled in the same way and its band-width is designed to receive only position reports from aircraft in the same height-band.

Radio Mailles is being developed in America—by Stavid Engineering, Inc.—as well as in France. Either large areas or long, narrow routes can be covered by suitable location of the transmitters. Long waves or sky-reflected short waves can be used for long ranges. Existing N.D.B. transmitters can be modulated for Radio Mailles use. V.H.F. and U.H.F. can be used for short-range precision systems for terminal and approach guidance.

ANOTHER GOOD SHELL FILM

FILM is a perfect medium for technical instruction, and aerodynamics—the science of invisible, animated airflow—is a subject which lends itself perfectly to film. The Shell Film Unit, in their well-known series *How An Aeroplane Flies*, proved how happy the marriage of film and aerodynamics can be; and they were encouraged to make a new series entitled *High Speed Flight*. Part 1, *Approaching the Speed of Sound*, has now been completed.

In making it, the producers have struck a nice balance between talking down to their audience and talking over its head. This is something not easily achieved when putting across a complex technical subject; but this new film, directed by Peter de Normanville, will please both bone-head and dome-head. In particular, it will please and instruct aircrews, civil and military, who are approaching the speed of sound.

The film is the first of its kind, to our knowledge, to make use of Schlieren photography—the technique (widely used in wind tunnel work) which exploits the refractive properties of changing-density airflow. The use of colour dramatically enhances the effect. Shell's technical adviser was S/L. J. N. Quick, M.A., A.F.R.Ae.S., of the Air Ministry.

Copies of Part 1 (16 mm or 35 mm, running time about 30 min) may be borrowed free by approved organizations from the Petroleum Films Bureau, 29 New Bond St., London, W.1. J.M.R.

CORRESPONDENCE

The Editor of "Flight" is not necessarily in agreement with the views expressed by correspondents in these columns; the names and addresses of the writers, not for publication in detail, must in all cases accompany letters.

ILSY Postscript

WITH considerable satisfaction and approval we have read your Mr. Owen's admirable report on the ILSY-6 air display, which the Koninklijke Nederlandse Vereniging voor Luchtvaart organized at Ypenburg on June 10. With its eleven pictures and three-and-a-half pages of your valuable space, you have really done us proud!

As it is almost impossible to write a report on such a varied show as the ILSY without meeting with any criticism, we hope you will forgive us for making a few corrections.

First, the three unfortunate villages which went up in smoke were supposed to be the victims of a natural disaster, such as an earthquake. Hence the "alarming sound effects," which were whistles and sirens, mobilizing help.

Second, the Jet Provost's inexplicable presence as a youthful intruder amongst the venerable vintage aircraft. This was the result of a get-together between the Shuttleworth people and Hunting Percivals, who thought up the idea of showing the R.F.C.'s famous trainer together with the R.A.F.'s latest.

Just for the record: the Klemm 107 was, unfortunately, not present as it was being prepared for the Deutschlandflug and was withdrawn at short notice.

Finally, we can tell you that the three balloons, commanded by Mr. and Mrs. Boesman and Mr. v.d. Bemden, landed safely after their leisurely voyage near de Biesbos, the country to the south-east of Dordrecht.

We hope that the foregoing will not give the impression of needless criticism, as all we intended was to point out a few minor inaccuracies, which do not detract in any way from our admiration for a truly excellent report.

The Hague. P. J. YPERLAAN
Secretary-General, Koninklijke Nederlandse Vereniging voor Luchtvaart.

Me109 Production

FURTHER to Lt-Cdr. Quill's letter (June 21) regarding prolonged production of the Spitfire and your comments that no fighter other than the F4U Corsair was in production for as long as 13 years, I suggest that the Me109 was in production for 20 years. The Spanish Hispano company carried on production of the 109 until 1954, building three types powered by the French Hispano-Suiza HS.12-Z-17 and the Rolls-Royce Merlin 500/45 engine, a total of 200 being built.

Upper Halliford, Middlx. A. BANFILL.

Flying a Kite?

THERE is such a beautiful earnestness about the article on Chinese Agricultural Flying in your issue for July 12 that were it not all so palpably sincere I could believe some ingenious person had been pulling your leg. To think of all those tarnished plant bugs growing up and laying eggs, those second-generation boll-worms in oviposition, and those snout beetles and leaf hoppers "presenting an equally menacing situation" (!); and what neat statistics have been achieved—98 per cent mortality among the plant bugs, 88 per cent among leaf hoppers and 86 per cent among snout beetles. Very soon life as an insect won't be worth living in China—certainly not for the red spiders, whose casualties are reported as 99 per cent.

Considering the Chinese are only beginners in this type of work, these results are astonishing, particularly as they have been achieved with aircraft which by Western standards are obsolete. Mention of Li-2s, An-2s and Aero-45s will surely send Mr. Edgar Percival and Mr. R. E. Bird hotfoot to China—now the trade barriers are nearly down—in search of new fields to dust.

Warrington, Lancs. PETER THOMAS.

Showing the Way

I WAS lucky enough to be able to attend the 22nd Paris Salon at the end of May and, on considering the weekend flying display, I remember your correspondent saying (I believe it was after the Geneva Show last year), "when will some other team show them the way home?" "Them" refers to the U.S.A.F. Skyblazers, then mounted on Sabres, and your correspondent seemed to be of the opinion that no team could ever hope to catch them up in formation aerobatics. I beg to differ.

At the Salon, the Skyblazers, each day, were no more than average. I am prepared to make allowances for them on the Saturday, when one of their number had to make a forced landing with the wind—fortunately, with complete safety, no damage to aircraft or pilot. On the Sunday, their show was good, but not superlatively so. To my mind, the best formation team in the show—one to show the Skyblazers the way home—was the Italian with its Sabre Es. Their formation was just about the tightest I have seen, and they kept station superbly. Their finishing manœuvre—a bomb-burst with smoke trails of bright orange, each then performing a perfect loop, still trailing smoke—was a thrilling climax to a great display.

London, S.W.6. ROGER W. SMITH.

Light Aircraft A.R.B. Requirements

THE Air Registration Board luncheon has been admirably reported in *The Times* and your own journal. During this function, Lord Brabazon is said to have spoken vigorously on the subject of relations with the A.R.B. on the one hand and the United States C.A.A. and Civil Aeronautics Board on the other.

It would appear that our own airworthiness requirements are not always treated with respect by the American authorities, who make a practice of raising difficulties over items which are sometimes of little importance. However annoying it must be to have its standards held to question, there must be many in this country who have wondered from time to time if our own Air Registration Board is always right in its decisions.

I have in mind the light 'plane situation in this country and my remarks are mainly aimed at this section. To this day, the majority of our light aircraft must be started by hand; the cost of having a starter and generator fitted is at least £200, and the results are often of doubtful efficiency, to say the least. I have recently been flying a well-known British light aeroplane with a small American engine. It starts as easily as a car, possibly because it is fitted with a car starter and car generator.

Whilst this would appear to be usual practice in the States, I am informed that the A.R.B. will not allow British engine manufacturers to adopt this procedure and that these small American engines are only allowed to fly in this country more or less on sufferance. Yet what could be safer or more reliable than these well-proved motor accessories?

Kirby Muxloe, Leics. A. E. BRAMSON.

False Start

REGARDING the picture appearing on p. 857 of the June 28 issue of *Flight*, I have reason to believe that the photograph was not in fact taken during the recent Dutch balloon race at Hengelo as stated, but shows balloons taking part in the Gordon Bennett race in Poland before the last war. This race was won on three consecutive occasions by Polish crews, and the Gordon Bennett Cup became the property of the Polish Aero Club. The balloons shown in your photo, i.e., Warszawa and LOPP, were destroyed during the last war. I have in my possession data and photographs to support this statement.

Brighton 6, Sussex. J. S. ORWOVSKI.

[Close examination of the original photograph—which accompanied a report received from Holland on the Hengelo race—supports our correspondent's view—Ed.]

An Historic Squadron

I HAVE been told on reasonable authority that it is proposed to disband No. 3 (F) Squadron, 2nd Tactical Air Force, under the latest cuts in the Armed Forces, and I should like to register my disapproval of such a short-sighted and, to my mind, ill-advised act of economy.

No. 3 Squadron would seem to have the right to be regarded as the founder-squadron of the Royal Flying Corps and Royal Air Force, having been the first unit to operate heavier-than-air aircraft as distinct from No. 2, which can be regarded as a "gasbag" outfit.

Since May 13, 1912, when No. 2 (Aeroplane) Company of the Air Battalion (R.E.) became No. 3 Squadron, R.F.C., this unit has—with remarkably few breaks—served the cause of the country from St. Omer and Amiens to Bangalore, Port Sudan and Berlin. It has earned respect, admiration and high award in two world wars and has long been associated with the great names of the veritable founders of R.A.F. tradition, such as H. R. M. Brooke-Popham, J. M. Salmond, and E. R. Ludlow-Hewitt. It seems that we are now to lose all this in another of those interminable cuts which have beset and bedevilled the Service in recent years.

Perhaps I am sentimental (if so, I'm glad I am), but why not retain this grand old unit and see that it is the first to receive the English Electric P.1, so that, once again, the squadron can live up to its motto, "Tertius Primus Erit"?

Westbury-on-Trym, Bristol. P. H. DOBBS
(Ex-A.C.2, No. 3 (F) Sqdn.).

Situation under control

The Decca System is fast becoming an integral part of the entire field of aviation. The Traffic Controller in particular has his task immeasurably lightened when Decca fitted aircraft fly on predetermined tracks, and their pilots are able to follow instructions precisely. For the first time he can integrate aircraft of all types—fixed wing or rotary, turbo-prop or jet, into a single air traffic control plan. Decca fitted aircraft navigating accurately with reduced separation standards enable him to make the greatest use of the limited controlled air space. He can do so because Decca is the only system accurate enough to ensure that aircraft *can* fly on track, on schedule, at all altitudes, in all weathers, over every kind of terrain. Decca tracks and reporting points have been established in the London F.I.R. since July 1956, and are now being introduced at Frankfurt. Now that Dectra, the long range navaid for the North Atlantic, is on the air the day when all the air routes of the world will be Decca flown comes nearer. Then indeed the situation will be under control.

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Personally speaking

—a series of contributions on questions of the hour by leading aviation personalities.

AIR VICE-MARSHAL SIR LEONARD ISITT, K.B.E.,

Chairman New Zealand National Airways Corporation, Chairman Tasman Empire Airways Limited, and one of the leading world authorities on Civil Aviation development in the South Pacific, makes this contribution on . . .

Aviation in the South Pacific

Geographical and sociological facts have shaped aviation in the South Pacific. Its future will be influenced by certain governing factors peculiar to this area : the terrain makes airport development difficult and costly ; most territories are isolated from each other by vast ocean distances ; the general population density is low and the potential travelling population limited. But these factors, together with growing population, expanding trade, inevitably increasing development of native peoples, are today creating ever greater demands for the air transportation of mails, passengers and cargo.

South Pacific aviation will always have its special problems which are, however, a spur rather than a brake, because the circumstances which create special difficulties also make aeronautical development vital to everyone who lives between Easter Island and the Commonwealth of Australia.

During the coming decade our civil air resources will be called on to meet a swelling demand for air transportation within, and to and from our area. During the last two decades we have established traditions, standards and skills upon which shall be built the future of aviation for the South Pacific—immediately destined, as it is, to provide closer communication with the world, whether communication is by letters and cargoes, or by peoples and ideas.

AVIATION BP SERVICE

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The international aircraft fuelling organisation of
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This handsome Meteor N.F.14, flown by F/L. J. H. Granville-White, formed an admirable photographic platform for taking the striking group of Hunters and Javelins reproduced in our July 5 issue. The Meteor sat for its own portrait in formation with "Flight's" Gemini.

SERVICE AVIATION

Royal Air Force and Fleet Air Arm News

F.A.A. Changes

FOLLOWING the retirement of Rear Admiral J. D. N. Ham, who has been Flag Officer Reserve Aircraft since October 1955, Rear Admiral A. J. Tindale-Biscoe has been appointed to that position. He has been Fleet Engineer on the staff of the C-in-C. AFMed at Malta since June 1955 and before that was captain of R.N.A.S. Anthorn. His new appointment took effect from July 8.

From that date also, the captain of R.N.A.S. Ford, Capt. H. C. N. Rolfe, was promoted Rear Admiral. This was announced in a recent list of promotions issued by the Admiralty. Rear Admiral Rolfe is to become Assistant Chief of Naval Staff (Warfare). Before going to Ford, he commanded the aircraft carrier *Centaur* and prior to that was captain of R.N.A.S. Culdrose.

Half-yearly Promotions

AMONG half-yearly promotions recently announced are those of the D.C.A.S., Air Marshal Sir Geoffrey Tuttle, and the Director-General of R.A.F. Medical Services, Air Marshal P. B. L. Potter, both of whom—at present holding acting rank of air marshal—are promoted from Air Vice-Marshal to Air Marshal.

Promoted from Air Commodore to Air Vice-Marshal are Acting Air Vice-Marshals E. S. Butler, A.O.A., Fighter Command; H. J. Kirkpatrick, A.C.A.S. (Operational Requirements); S. C. Elworthy, Commandant, R.A.F. Staff College, Bracknell; W. L. Freebody, Director of Work Study, Air Ministry; A. F. Cook, Principal Medical Officer, M.E.A.F.; and A. Cdre. F. W. P. Dixon, Consultant in Surgery, Central Medical Establishment, R.A.F.

A.D.C.s to the Queen

IT was recently announced that the Queen had approved the following changes in appointments as aides-de-camp to Her Majesty with effect from June 18:

G/C. F. E. Rosier in succession to A. Cdre. B. K. Burnett (on the latter's promotion to Air Commodore); G/C. D. F. Spotswood in succession to A. Cdre. G. C. Eveleigh (on the latter's promotion

During her busy visit to R.A.F. Abingdon last week, Princess Alexandra inspected a guard of honour and had the purpose of parachute static-lines explained to her by W/C. J. R. W. Blyth, commanding officer of No. 1 Parachute School. Modelling the subject under discussion is Sgt. J. Drinkwater, one of the R.A.F. instructors. "Flight" photographs

SERVICE AVIATION . . .

to Air Commodore); G/C. H. N. G. Wheeler in succession to A. Cdre. E. D. McK. Nelson (on the latter's promotion to Air Commodore); G/C. P. G. St. G. O'Brian in succession to A. Cdre. D. S. Radford (on the latter's promotion to Air Commodore); G/C. A. H. McM. Hely in succession to A. Cdre. E. N. Lowe (on the latter's promotion to Air Commodore); and G/C. C. V. Mears in succession to G/C. R. L. M. Hall (on the latter's retirement from the R.A.F.).

R.A.F. Work Study

IN a report on the first six months' application of work-study methods to the R.A.F., A.V-M. W. L. Freebody, Director of Work Study, said last week that it was now possible to refuel and rearm a Hunter with four men instead of ten in two-thirds of the time previously taken; that joining procedure for personnel going to new stations had been cut down from a day to 40 minutes; that Canberra squadron performance had been improved with a 20 per cent reduction in establishment—and that V-force operation and maintenance was being studied on the same lines.

A.V-M. Freebody said that work-study techniques used in the RA.F. were basically the same as those in industry, though not so intricate and precise—except, for example, in emergency escape procedures, where split seconds counted. Amongst his responsibilities was running a small school through which some 180 air officers and 640 officers and civilians had already passed. Work study in the R.A.F. did not relieve a commander of responsibility for achieving manpower economy or any other form of improvement; but it could be "a powerful aid to his efforts."

First A.E.O.'s Qualify

AT R.A.F. Swanton Morley, Norfolk, last week the first ten officers to be trained at the station's Air Electronics School received their brevets from Air Marshal Sir R. L. R. Atcherley, A.O.C-in-C. Flying Training Command. In addition the course's outstanding pupil, F/L. N. R. MacNicol, was presented with the Cup of Honour.

Addressing the parade, the officer commanding Swanton Morley, W/C. G. H. Porter, said it marked the end of the first "all through" course for A.E.O.s at the school and was the culmination of a year's training during which all graduates had completed approximately 85 hours' flying in Ansons and Prentices.

Air electronics officers form the newest aircrew category in the R.A.F., with an important rôle in operating the modern weapons systems in aircraft of Bomber and Coastal Commands. Those who have just qualified at Swanton Morley are to have a fortnight's flying course before going to operational conversion units at Gaydon for training on Valiants and at Waddington for Vulcan training.

A.F.C. for R.C.A.F. Pilot

WITH a citation speaking of "courage, presence of mind and exceptional airmanship which resulted in the possible saving of lives and certainly in the saving of a costly aircraft which he could have abandoned without fear of criticism," R.C.A.F. headquarters recently announced an award of the Air Force Cross to F/O. L. T. Ross of No. 433 Sqn., based at North Bay, Ont.

F/O. Ross was flying a CF-100 in cloud at 20,000ft when an explosion occurred in the port engine, blowing the top cowling off and starting a fire. He applied emergency procedures and, although he could not be sure the fire was out, decided against abandoning the aircraft as he was over a populated area. Despite adverse weather conditions and low cloud on his return to base, F/O. Ross successfully landed his aircraft after making three unsuccessful attempts.

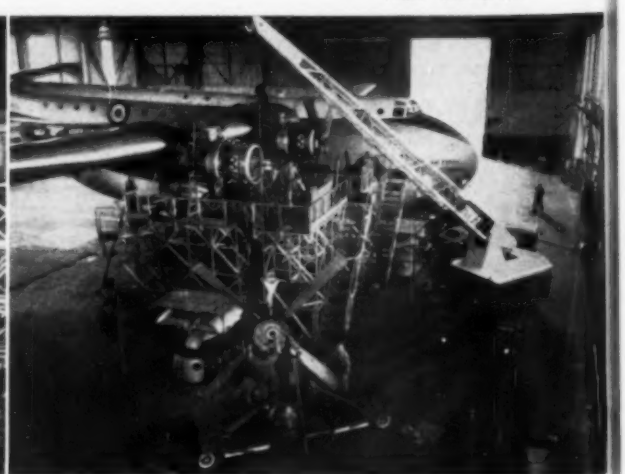
Beverley Crash Awards

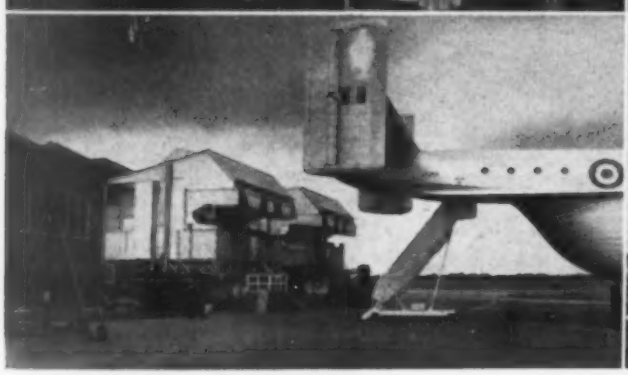
AWARDS to two R.A.F. officers for their efforts to extricate survivors from the Beverley which crashed on the village of Sutton Wick, Berks, on March 5 were announced in a supplement to the *London Gazette* last week. W/C. S. W. Harrison, station chaplain at R.A.F. Abingdon, is appointed O.B.E. and F/O. C. A. S. Evans, a medical officer there, M.B.E. They "displayed courage and resourcefulness of a high order," says the citation, "refusing to give up while there was hope of finding survivors among the wreckage."

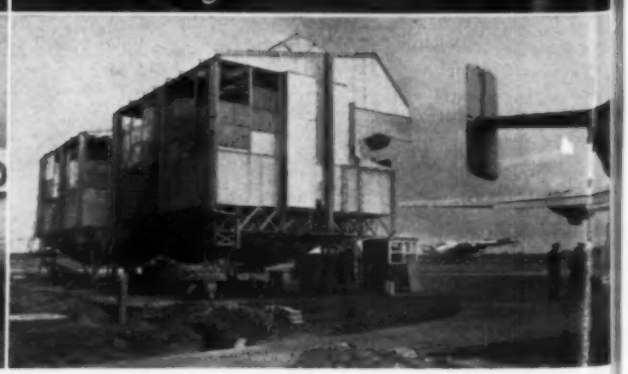
IN BRIEF

Past members of No. 94 Sqn. who are eligible to wear the squadron tie and wish to purchase it should contact C. H. Munday, Ltd., Club Colour House, 7 Irving Street, Leicester Square, London, W.C.2. The ties (of pure silk) cost 15s each plus postage.

Immediately below, work in progress on Beverleys in a hangar at R.A.F. Abingdon—visited by Princess Alexandra on July 9—and (in the bottom pictures) views of the Beverley servicing dock employed there, use of which enables major engine maintenance to be carried out without an aircraft having to wait for hangar accommodation. "Flight" photographs







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WESSEX

Westlands Demonstrate their Gazelle-powered Helicopter

A HIGHLY creditable first flight (to which we made reference on May 24), close kinship with the successful Sikorsky S-58, and a distinguished name with historic associations—all these lead one to feel on quite familiar terms with the Westland Wessex. Yet there is a great deal that is entirely novel and has hitherto been confidential outside the Yeovil factory. Last week a first demonstration was staged and, after only 2½ hours in the air up to that time, the aircraft was given the full treatment by W. H. ("Slim") Sear, Westland's chief test pilot.

The Napier Gazelle turboprop engine is undergoing flight development with the aircraft it powers; so far, in de-rated form, it has performed faultlessly. This particular version is known as the NGa.11, the first figure indicating left-hand rotation for the power take-off from the free power-turbine. This engine has a rating of 1,100 s.h.p. Next will be installed the NGa.13 of 1,450 s.h.p. In passing, it may be noted that with a free-turbine design the sense of rotation can be reversed comparatively easily by handing only the nozzles and blades of the power turbine.

Westlands acknowledge their good fortune in having a gas turbine like the Gazelle available. The union was fortuitous rather than planned. The Royal Navy needed a helicopter capable, in general terms, of doing twice the job of the S-55 Whirlwind—better expressed, perhaps, as the job hitherto handled by a hunting-and-striking pair. The Navy also wishes to clear its ships of petrol in favour of all-paraffin fuel. Unlike the Whirlwind, with four-wheel undercarriage, the Wessex has a tailwheel tricycle.

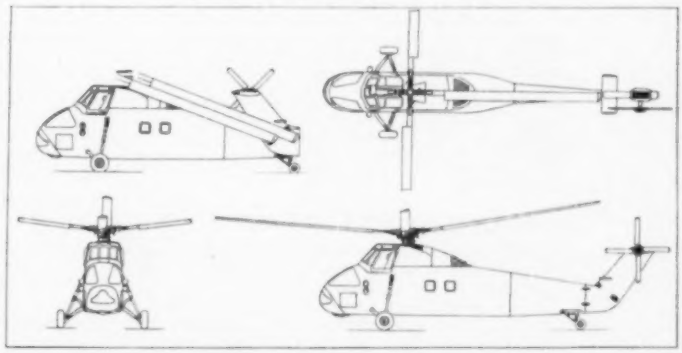
Through agreements with the American Sikorsky company, Westlands had the very suitable S-58 to offer as a basic design, but with the Wright R-1820 piston engine. The marriage of S-58 airframe with the British Napier gas turbine engine followed naturally. Equally important, it could be arranged without appreciable loss of performance, even though the operational rôle requires long endurance at low altitudes. The specification calls for approximately a 60:40 per cent ratio of hover to forward flight. The range and endurance break-even point will occur at about 3 hours for the differently powered aircraft, when the Wessex is fully developed.

For short-range duties in civil guise—or for the Army, perhaps—the Gazelle power offers considerable advantage by virtue of power-unit weight saved. A brief list of provisional figures is included on page 94; particularly noteworthy are the speeds—during his demonstration Slim Sear certainly exceeded by at least 10 kt in steady flight, the sideways and backwards speeds quoted.

At this early stage the I.P.N. (iso-propyl-nitrate) turbine starter has not been installed; but even with the aid of external accumulators a start-from-cold-to-airborne time of well under one minute was recorded. This will be cut to about 30 sec. Thanks to the free-turbine power and the absence of a clutch in the transmission, the big four-blade rotor can be accelerated from zero to take-off r.p.m. in 15 sec. These are remarkable figures, comparing with some five to ten minutes for a piston engine starting from cold and at least twice the rotor acceleration time.

The test pilot remarked on several points of practical interest. Contrary to expectations, the acceleration of the Gazelle for hovering prior to touch-down after a near-to-idling approach is rapid enough to compare normally with the throttle-response of a

(*Concluded on page 94*)



Below, four jet outlets—two each side—give a balanced exhaust from the turbine which benefits it considerably. This prototype nose design will be modified in many details to conform with the outlines indicated in the g.a. drawings. Right, the main rotor blades and the whole tail hinge to fold. Westlands and Sikorsky have worked out powered rotor-folding systems should they be called for.

"Flight" photograph

A big moment for a small firm was last week's maiden flight of the Aviation Traders Accountant. Here, after the event, "Flight's" photographer catches (from left to right): Messrs. F. A. Laker, director; D. S. Turner, chief of flight test; A. I. Johnson, Accountant project manager; L. P. Stuart-Smith, test pilot.

CIVIL AVIATION

ACCOUNTANT AIRBORNE

ON Tuesday of last week the prototype Aviation Traders Accountant made its first flight from the company's base at Southend. In the hands of Mr. L. P. Stuart-Smith, the firm's test pilot, the smart red and white aircraft was in the air for about 27 minutes. Mr. D. S. Turner, chief of flight test, was the observer.

The Accountant's interior is as yet furnished only with recording equipment, and the aircraft has a special metal-covered floor to which these installations are bolted. Latest data for the aircraft are as follows:—

Span, 82ft 6in; length, 62ft 1in; overall height, 25ft 3.5in; wing area, 632 sq ft; aspect ratio, 10.77; wing loading, 44.3 lb/sq ft; total fuselage capacity, 1,670 cu ft; gross weight, 28,500 lb; initial max. landing weight, 27,100 lb; zero fuel weight, 26,500 lb; fuel, 1,280 Imp gal; max. V.F.R. stage-length 2,420 st. miles; max. V.M.C. stage with 28 passengers and luggage, 1,020 st. miles; operating altitude, 25,000ft; mean cruising speed, 295 m.p.h.; S.L. balanced field length at 28,500 lb I.S.A., 3,220ft; at I.S.A. + 15 deg. C, 3,400ft; at I.S.A. and 5,000ft altitude, 4,000ft; rate of climb, S.L. and I.S.A., 1,500 ft/min; single-engine climb, 500 ft/min; time to 25,000ft (two engines), 27.6 min; stalling speed, 69 kt.

ANOTHER DART-POWERED EXECUTIVE

JUST before the first flight of the Accountant last week came news of a twin-Dart executive transport project from America —a 12-passenger design by Grumman, designated Design 159. A general arrangement drawing appears on the right.

There are evident similarities between the Grumman project (the company's first civil venture since the Malard amphibian of 1947, and yet another design to pay court to Rolls-Royce) and the Accountant. An important difference is that the Accountant uses Dart RDa.6s (1,740 e.h.p.), while the Grumman 159 is to have the more powerful (2,100 e.h.p.) RDa.7 Mk 2s—with structural provision for the absorption of higher-powered Darts.

It is reported that Grumman do not necessarily intend their executive turboprop to meet the U.S.A.F. and U.S. Navy specifications (see *Flight* last week, pp. 36-38) but are offering the 159 primarily to the civil market. It is their intention to sell only "bare-hull" aircraft, and to appoint distributors to sell to customers. This would mean that the business of furnishing executive interiors and of installing special radio, navigation and accessory equipment would be the responsibility of the distributors. It has been estimated that for this type of aircraft ten per cent of the purchase price can be absorbed by custom-built interiors alone. A certain amount of special equipment such as integral stairs (angled to clear the propeller) and an auxiliary power unit for ground-conditioning and so forth would, however, be included in the delivered airframe.

A full-scale mock-up of the Grumman 159 has been built but, although the roll-out date has been given as May 1958, assembly has not yet begun. Two prototypes are to be built, and it is reported that Grumman will go to Florida for flight-testing if they are delayed by New York's weather.

A comparison of the following estimated data for the 159 with those of the Accountant confirms the impression that the two aircraft will be direct contestants for a similar market:—

Grumman Design 159. Span, 78ft.; length, 64ft; height overall, 22ft 1.5in; cabin length, 31ft 6in; height, 73in; window area, 330 sq in; gross weight, 31,000 lb; empty weight, 12,000 lb; take-off power, 2 × 2,105 e.h.p.; cabin altitude at 25,000ft, 5,000ft; cruising speed at 25,000ft, 370 m.p.h.; fuel, 1,230 Imp gal; maximum stage-length including 230-mile diversion and 30 min hold at 25,000ft, 2,200 st. miles; S.L. rate of climb, 2,300 ft/min; single-engine climb at S.L., 700 ft/min; C.A.A. field length at 31,000 lb gross weight at S.L., 4,000ft; at 26,000 lb, 3,000ft; at gross weight and 5,000ft altitude, 5,000ft.

THE LIFE OF CAPITAL'S VISCOUNTS

FOR many months now the U.S. domestic airlines have been pressing the Civil Aeronautics Board for an increase in fares. The C.A.B. have resisted this pressure, arguing that the industry's balance sheets are not as gloomy as the airlines are suggesting. In many cases the C.A.B. have looked into individual airline accounts, and in doing so have adopted accounting methods different from those of the airlines. It was inevitable that some animosity should ensue.

For example, Capital Airlines depreciated its Viscounts over seven years with a ten per cent residual value. But C.A.B.'s staff depreciated the company's Viscounts over ten years, with 15 per cent residual value, saying: "There appears to be no technical development which would make the Viscount obsolete in less than ten years."

Capital disagree with C.A.B.; and the airline's chief of finance, Mr. S. B. Goldthorpe, says: "We believe that the competition of the newer turboprops and the jets will force the Viscount into [obsolescence] long before 1967, probably by 1963." He feels that such "arithmetical extension" of depreciation rates create a false appearance of better results, and is a "dangerous" technique to use in evaluating a rate structure. Capital also maintain that C.A.B's staff made an error of £260,000 in computing Viscount flying costs.

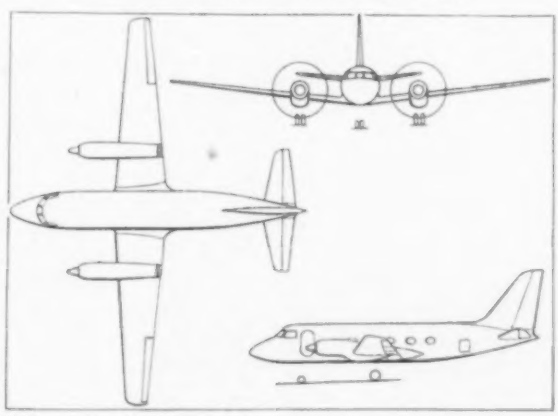
OFF THE BEATEN TRACK

ONE of the problems to be resolved before an ideal North Atlantic air traffic control system can be established is that of maintaining separations between aircraft engaged in so-called pressure-pattern or jetstream flying. The advantages to be gained by making use of favourable winds can be very large; an estimate at an Institute of Navigation meeting in Washington recently put the potential value at 12 kt of wind per crossing. In terms of hard cash, this was estimated by a PanAm representative to be worth about £600 per trip to the operator, representing a formidable total for the 45,550 Atlantic crossings, civil and military, made last year.

Detours of several hundred miles are often made by captains to take advantage of favourable winds, and if maximum economic advantages are to be gained north Atlantic navigation aids will, it was said, have to accommodate the resultant scatter from the most direct routes. A speaker at the Institute meeting suggested that more information was required on the detours made by captains following pressure-pattern routes.

A glance at the coverage offered by Dectra, the new north Atlantic navaid now being tested, does in fact indicate that the system promises considerable flexibility and accuracy well off the beaten track.

Grumman 159 project (two Rolls-Royce Darts).



The *Swift* beats an international field in Low-level Reconnaissance Contest

In the international low-level reconnaissance competition held recently by the Allied Tactical Air Forces at Laarbruck, first and second places were won by Vickers Supermarine Swifts F.R. Mark 5. The field was composed of aircraft from many air forces, including French, Dutch and Belgian F.84Fs, and American B.57s.

The winning pilot. Flt. Lt. A. D. Laurence of No. 79 Squadron R.A.F., scored 120 points out of a possible 200 on his fastest mission over 160 miles. Targets included camouflaged Army vehicles, airfields and bridges, and the mission demanded accurate visual reporting, speedy photograph processing and immediate intelligence reports.

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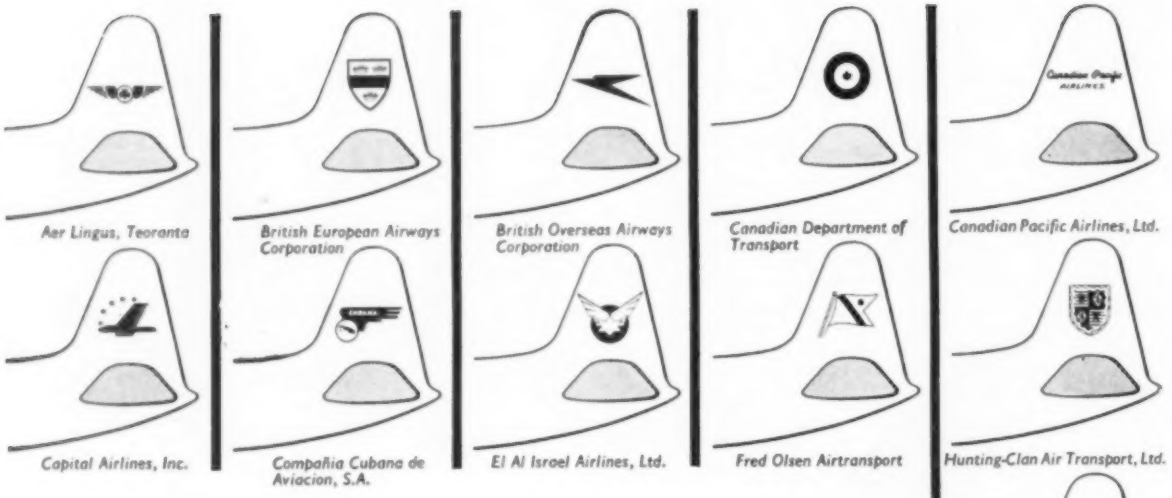
TGA AT547

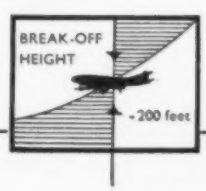


CHOSEN BY 19 OPERATORS

The performance of the Smiths S.E.P.2 Autopilot covers the entire speed range of modern civil aircraft. Offering many new and important features, including barometric height and speed control, and automatic pre-selected heading, it is already in use or on order for 19 airlines. The S.E.P.2 gives stabilised flight even in the worst of weather conditions, adds new precision to airfield approach and helps considerably in the maintenance of stringent schedules.

SMITHS

S.E.P.2 AUTOPILOT



IN SERVICE AND ON ORDER FOR 19 OPERATORS

SMITHS AIRCRAFT INSTRUMENTS LIMITED

The Aviation Division of S. Smith & Sons (England) Limited, Cricklewood, London, N.W.2

TGA 5M46

CIVIL AVIATION . . .

A NEW WEST GERMAN TURBOPROP

FROM West Germany comes news of the HFB-209, a turboprop transport project which appears to be similar to the Spanish CASA-209 design previously described. The HFB-209 falls into the Viscount or turboprop Convair class, and is the work of the Hamburger Flugzeugbau Company, which descends from the Blohm and Voss concern. Two Napier Eland NEl.6 engines of 3,500 e.h.p. will be fitted, but the alternative installation of either Allison 501D-13s (the Electra's engine) or Rolls-Royce Tynes is offered. Seating capacity is 48 to 54. Provisional data for the Eland version of the HFB-209 are as follows:—

Span, 93ft 8in; length, 76ft 6in; height, 29ft 8in; wing area, 963 sq ft; aspect ratio, 9.12; take-off weight, 45,080 lb; typical payload, 9,520 lb; empty weight, 24,050 lb; single-engine take-off distance to 50ft, 3,880ft; both engines, 1,850ft; rate of climb at max take-off weight, s.l., 2,260ft per min; cruising speed at 20,000ft, 277 kt; stage-length with 48 passengers and reserves, 1,025 n.m.; landing distance from 50ft with reverse thrust, 1,260ft.

FAIRCHILD FRIENDSHIP FINANCING

THAT all is not well with the American local-service airlines is an understatement: they nearly all need replacements for their DC-3s, but just cannot afford to finance them. Nevertheless, orders have been placed for a total of 25 Fairchild Friendships by such operators as West Coast, Mackey, Frontier, Bonanza and Piedmont. But it seems that of these 25 only nine, and possibly fewer, have been completely financed.

This has been revealed, according to the American journal *Aviation Daily*, by Mr. G. R. Henry, Bonanza's executive vice-president, testifying before a Senate aviation sub-committee. According to Mr. Henry, Fairchild have taken orders "largely on good faith", and he emphasized that the local-service carriers need government-guaranteed loans to re-equip.

The financial problems of U.S. local-service airlines seem to apply to similar carriers elsewhere in the world. The market for short-haul branchline transports is huge; but it is also financially depressed.

NEW RUSSIAN TRANSPORTS

ONLY scanty information is available about five new types of Russian transport, three jets and two turboprops, which were on show or announced at the Vnukovo airport (Moscow) air display on July 10. Admission to this show was refused to foreign observers. A piecing-together of reports from various sources, including Moscow Radio and *Pravda*, yields the following information:—

Tu-104A: A development of the Tu-104, seating 70 instead of 50 passengers. Cruising speed is approximately 500 m.p.h. (about the same as that of the Tu-104) and not 620 m.p.h. as quoted in some reports.

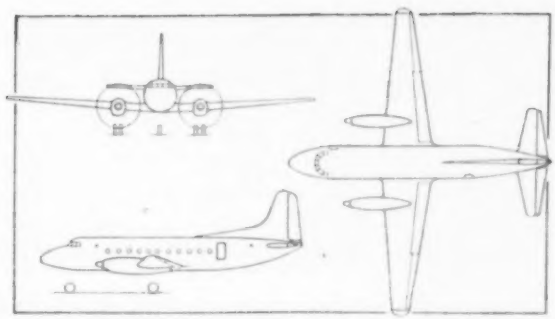
Tu-110: A larger-capacity (78 to 100 passengers), longer-range (2,160 st. miles), four-turboprop airliner. The engines are ascribed to A. M. Lyulka.

Tupolev Rossiya: A four-jet, 180-passenger transport, due to fly in October. It will be capable of 4,300-mile stages at a cruising speed of over 550 m.p.h.

Antonov Ukraina: An 84-passenger, four-turboprop, 370 m.p.h. transport, now on test. (Described in *Flight* of March 29.)

Ilyushin Il-18 Moskva: Also being test-flown, the Moskva is powered by four 4,000 h.p. turboprops, and has a gross weight of about 120,000 lb. Cruising speed is given as 405 m.p.h., and range 3,100 st. miles. Seating-capacity is said to be 70 to 100.

All these new aircraft, says Moscow Radio, "will be in use by Soviet civil aviation within the next few months."



Hamburger Flugzeugbau HFB-209 project (two Napier Elands).

OLYMPIC AIRWAYS BUY DC-8s

THE new Greek airline Olympic Airways has, as forecast, ordered two Douglas DC-8s for delivery in 1960, with an option on a third. The order emphasizes the big international ambitions of Mr. Aristotle Onassis's new company, which recently took over the operations of T.A.E. National Greek Airlines. DC-6Bs are being used on international services in the meantime.

Olympic's order brings to 122 the number of DC-8s sold to 14 airlines. This compares with a score of 122 for the Boeing 707, ordered by 12 airlines. It is noteworthy that new customers for both aircraft are still being offered 1960 delivery.

EAGLE AND SKYWAYS JOIN I.A.T.A.

TWO more private British airlines, Eagle Airways and Skyways, have been admitted to membership of the International Air Transport Association. Two others, Hunting-Clan and Airwork, have been members since 1953 and 1954 respectively.

The fact that the two companies have joined I.A.T.A. does not necessarily suggest that they are planning on immediate international expansions. Both airlines are, of course, already operators of scheduled international services; Eagle fly to France, Spain, Luxembourg, Austria, Scandinavia and Germany, and Skyways operate to France. Such routes, in common with those of other independents, are operated at I.A.T.A.-rate fares approved by the governments concerned, and in competition (direct or indirect) with I.A.T.A. carriers. The anomaly of operating at fare-rates recommended by other airlines, and of having no say in rate-making, must have been increasingly strongly felt. Both companies evidently feel that they will be in a stronger position to consolidate and expand their share of international business if their voices can be heard inside, rather than outside, I.A.T.A.

ELECTRA PROGRESS

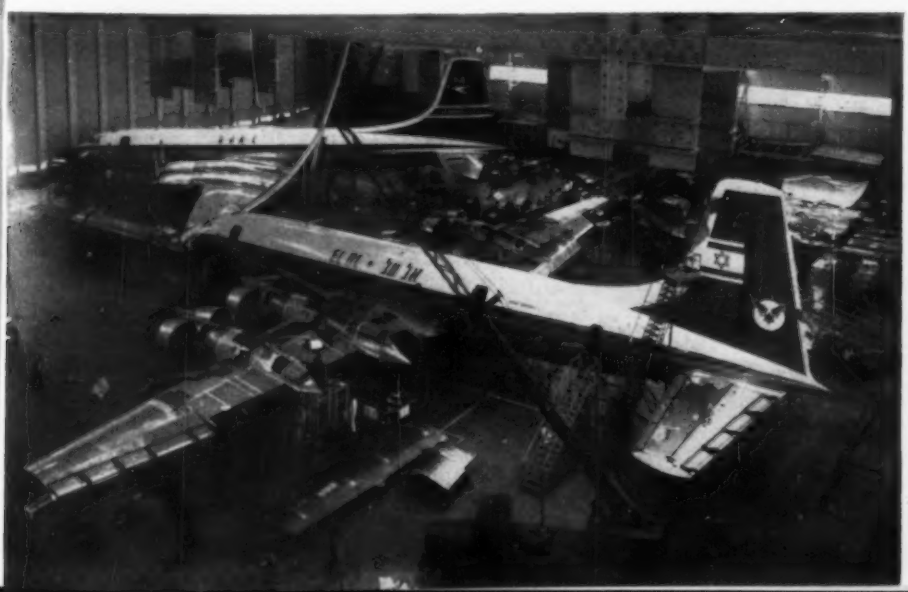
FROM Lockheed comes a new pictorial printed report on progress with the Electra. It is subtitled *Electra . . . Perfect Partner to the Jet in the Turbine Age.*

Components of the air conditioning system, report Lockheed, are being installed in a special 40ft mock-up of the fuselage, and are being tested in simulated flight conditions. Testing of general air conditioning system behaviour—floor temperature, circulation and temperature "stratification"—has been completed.

Another fuselage mock-up, a 26ft section, is being acoustically tested to determine the sound-deadening effect of various insulation materials. A loudspeaker outside the mock-up transmits "all types and volumes of sounds."

The now-famous interior mock-up has received 950 improvements as a result of continual evaluation. The full-size metal engineering mock-up is being equipped with complete systems, and is making it possible for the C.A.A. to give preliminary approval to the "new engineering concepts" in the Electra.

First flight of the first Electra (a photograph of its nearly completed fuselage appeared last week) is still scheduled for February 1, 1958.



The first Britannia for export, one of three 313s for El Al Israel Airlines, nears completion at Bristol. Beyond is the second of eighteen 312s for B.O.A.C., G-AOVB, which flew on July 5. Both aircraft are due on the North Atlantic route later this year.

CIVIL AVIATION . . .

BREVITIES

A NEW twice-weekly Viscount 701 service from London to Prague will be opened by B.E.A. in October, subject to Government approval. The service will be operated in association with Czechoslovakian Airlines, who will fly Il-14s at the same frequency.

* * *

Swissair carried 106,000 passengers in June, passing the 100,000-mark for a single month for the first time in its history.

* * *

T.W.A. will be the first U.S. airline to begin trans-polar operations. An L.1649A service between California and London should start late next month.

* * *

B.O.A.C. Britannia 102s are to serve Aden and Colombo in August, taking over from Constellation 749As and reducing schedules to each point by three to four hours.

* * *

Air France took delivery of their first Lockheed L.1649A on July 9. The aircraft, the first of 10, flew from Los Angeles to Paris non-stop (5,800 miles) in a record time of 17 hr 11 min.

* * *

The first B.O.A.C. Britannia 312, with an El Al captain, flew from Bristol to Lydda airport on July 9. The flight was made for training and demonstration purposes. The first El Al Britannia 313 (see page 93) is nearing completion.

* * *

Air Chief Marshal Sir Hugh Lloyd, K.C.B., M.C., D.F.C., R.A.F. (retd.) has been appointed to the Board of Airwork's engineering subsidiary company, Airwork General Trading Co., Ltd. Sir Hugh, who started his career in the Army and transferred to the Royal Air Force in 1918, is a director of Transair, which was acquired by Airwork last year.

* * *

Skyways have redesigned their DC-3s to increase seating accommodation from 32 to 36. The modifications include a redesigned floor — a lighter aluminium honeycomb sandwich being used to replace the existing structure. The company is using its modified aircraft on a new Coach-Air service to Vichy; the journey from the centre of London takes about five hours for a return fare of £17 19s.

Following reports of interest in the Napier Eland among Brazilian Convair operators (R.E.A.L. and Cruzeiro do Sul in particular) comes this picture from the Napier Company. It shows two members of a Brazilian Air Ministry mission which recently visited Napier establishments in England. Seen at Cranfield with the Napier Eland-Convair 340 (in which they made a 1½-hour flight) are, from left to right, Mr. E. W. Bruce Hill and Mr. W. E. Hampton (both of Napier); and Major Augusto Veiga and Professor D. A. Anderson of the Brazilian mission.

Trek Airways of South Africa are replacing their Viking fleet with DC-4s.

* * *

Elected to be members of the Council of the Institute of Transport are Mr. Keith Granville, commercial director of B.O.A.C., and Mr. C. A. Herring, personnel director of B.E.A. The next annual dinner of the Institute will take place on March 21, 1958, at the Dorchester Hotel, London.

* * *

A total of 205 transports in the DC-6/DC-7 series is on order and still to be delivered, say Douglas. These include 81 DC-7s, 48 DC-6Bs, 42 DC-7Cs and 34 DC-6As. A total of 869 DC-6s and 7s have been sold to 23 American and 26 international operators since the first DC-6 entered service ten years ago. In addition, 168 of the military version have been delivered, bringing the total sales to 1,037.

WESSEX (Continued from page 91)

piston engine. The power lever can also be banged open without signs of stalling the engine. The Gazelle is so quiet in the air that a flight observer was unable to hear it, and believed power had failed. The engine dials need only be checked occasionally, and for the most part rotor speed and throttle are all that call for attention. The gas-producer section of the Gazelle amounts to a constant-speed unit which looks after itself. (What the pilot actually said was that he "had not needed five eyeballs after all." And in amplification, that an engine speed governor and an auto-stabilizer for hovering might come later as refinements for civil use, but were unnecessary now.)

In spite of the positioning of the four exhaust stacks, no fumes entered the cabin or cockpit in normal flight; traversing with window open—an occasional manœuvre of short duration—might be an exception. In addition to this pair of stacks each side, there are two smaller intake pipes—high on the starboard side of the nose and low on the port. These are intakes for cooling air to the engine compartment within the enclosed-bell-shaped firewalls. (The wide end matches up to the bulkhead.) The exhaust stacks are concentric within the cooling-air outlets and induce the cooling flow.

From the ground, the Wright-powered S-58 is a very noisy machine, but the Wessex with Gazelle is exceptionally quiet. The main sound—a whirring—comes from the tail rotor, now clearly heard for the first time. The turbine sounds like a kettle on the boil. Strangely enough, there is a suggestion of the old Swordfish in the fly-over noise of the Wessex. This quietness is important for the crew in a Navy rôle, and for possible civil applications in the future. In fact, a 12-seat civil Wessex might have a pair of smaller turbines to provide twin-engine safety. But twinning can bring matching problems, as the Americans have probably discovered while studying a 2 × T58 (G.E.) trial installation in the S-58.

In the course of the demonstration Slim Sear showed the remarkable rate of in-flight climb even with the low-rated engine, and he illustrated very well the excellent manœuvrability and the steadiness in hovering flight and on touch-down. The combination of speed, size and subdued noise gave the up-and-down runs and turns the character of a fixed-wing transport demonstration. The Wessex, in fact, gave a purposeful impression not usually apparent in helicopter capers.

Already this prototype is by gradual substitution largely of British construction, and it may be expected at Farnborough in September. Later machines will differ in nasal treatment. The smaller, much lighter Gazelle, now installed in a fireproof barrel, occupies only a part of the nose; so it will be possible to replace the clamshell doors by a simple up-hinging nose cone—small, yet large enough to allow withdrawal of the Gazelle (by its own hoists in the field). At each side, low down, will be a rectangular inspection door hinged at the lower edge and sturdy enough to act as an inspection platform for two upper hatches which give access to electrical and other equipment to be grouped there. This equipment, assembled from around the aircraft, is not only readily accessible, but makes up for the reduced engine weight forward and re-balances the aircraft without resorting to dead-weight ballast.

Exceptionally good serviceability of instruments and equipment is expected to follow the adoption of gas turbine power and the clutchless drive provided by the free turbine is likely to reduce fatigue to a marked extent, and thus increase component life.

Estimated performance (I.S.A. conditions).—High speed at sea level (12,600 lb) 125 kt plus; cruising speed at sea level, 90 kt plus; maximum sea-level rate of climb (one-hour power), 1,650ft/min; vertical sea-level rate of climb (one-hour power), 600ft/min; hovering ceiling in free air (take-off power), 5,000ft; hovering ceiling with ground effect (take-off power), 7,000ft; cruising fuel consumption, 90 Imp. gal/hr; range (normal fuel capacity of 300 Imp. gal), 340 miles; maximum speed in sideways flight, 35 kt plus; in backwards flight, 30 kt plus.

Dimensions.—Overall length, 65ft 9.32in; overall length (tail folded), 38ft 2in; width, 13ft; overall height at main rotor, 14ft 3.45in; overall height at tail rotor, 15ft 10in.

Weights.—Empty weight, 7,259 lb; normal all-up weight, 12,600 lb; internal freight load, 2,000 lb; external sling load, 4,000 lb.

Three new directors—(left to right) Messrs. C. J. Bridge, M.B.E., T.D., H. B. Sedgfield, M.B.E., B.Sc., A.M.I.E.E., and S. E. Spicer, A.C.A.—have been elected to the Board of the Sperry Gyroscope Co.

THE INDUSTRY

Bendix-Thorn Licence Agreement

AN agreement has been concluded between the Bendix Aviation Corporation (U.S.A.) and Thorn Electrical Industries (Great Cambridge Road, Enfield, Middx) to manufacture in this country the Bendix range of A.N. and Pigmy connectors, in addition to a range of unitors.

The A.N. range for missiles and aircraft includes a variety of pin combinations in a number of different sizes of shell. Basically, five types are available and the interiors are interchangeable between the fixed and free members. Apart from types for general applications, pressurized and environmental resistance plugs and sockets are available, in addition to a limited range of fireproof items.

Pulsometer Acquire S.P.E.

IT was announced last week that the Pulsometer Engineering Co., Ltd., of Reading, have acquired the whole of the issued share capital of the Self-Priming Pump and Engineering Co., Ltd., of Trading Estate, Slough, manufacturers of aircraft fuel pumps and hydraulic equipment.

Mr. F. B. Duncan, chairman of Pulsometer, and Mr. J. S. Woodrow, managing director, have joined the Board of Self-Priming.

Anglo-American Electronics

THE Capital Issues Committee has consented to the formation of a new company, Amphenol (Great Britain), Ltd., with a fully paid share capital of £100,000, half of which will be subscribed from the cash resources of the Gas Purification and Chemical Co., Ltd. (Palmerston House, Bishopsgate, London, E.C.2) and half by Amphenol Electronics Corporation of Chicago.

Founded in 1932, the American company is a large-scale producer of electronic components, these including general electrical connectors, high-frequency connectors, cables and cable assemblies, and plugs and sockets.

Acting under a licence exclusive to the British Commonwealth (excepting Canada) the new British company will produce the entire Amphenol range in this area and also on the European continent. Certain components will initially be imported from America, but there will be a progressive move towards 100 per cent production of articles particularly suitable for the European market.

The object of the new venture, it is stated, is "to give British manufacturers access to . . . components with a large degree of international standardization". It is claimed that practically every U.S. guided missile—including Nike, Regulus, Sparrow, Falcon, Talos and Atlas—incorporates Amphenol components, which are also being used in such commercial jet aircraft as the Boeing 707 and Douglas DC-8.

Managing director of Amphenol (Great Britain), Ltd., is Mr. Arthur Marks; chief engineer is Mr. G. L. Stephens; and Mr K. F. Bridle and Mr. R. B. Page are directors.

Sterling Metals Half-Century

TO celebrate its 50 years' existence, Sterling Metals, Ltd., held a golden jubilee dinner on Thursday of last week. The chairman, the Marquess of Exeter, presided; the toast to Sterling Metals was proposed by Mr. J. Wright of the Dunlop Rim and Wheel Co., Ltd., supported by Mr. S. N. Evans; and the reply was by Sterling's managing director, Mr. E. Player. The chairman proposed the health of the guests, and this was responded to by Mr. H. Heath (of the Coventry Radiator and Presswork Co., Ltd., and the Coventry and District Engineering and Employers' Federation). Over 200 people attended the dinner, including members of the company and guests who represented a very wide cross-section of the aircraft and motor industries, with which Sterling Metals have been closely associated since their foundation.

The company was formed—on June 26, 1907, in Coventry—mainly to produce aluminium castings, and it early identified itself with the growing motor industry. Within four years it was employing over 500 people, and during the First World War it made the bulk of the cast-iron air-cooled cylinders used in British military aircraft. In 1922 the company acquired British manufacturing rights for the production of Elektron magnesium-alloy castings, and in 1929 it amalgamated with the Birmingham Aluminium Casting Co., Ltd., and the Midland Motor Cylinder Co., Ltd. All three concerns are now members of the Birmid group of companies.

During the inter-war years the applications of both aluminium and magnesium were extended; development of magnesium landing wheels was undertaken for the Dunlop Rim and Wheel Co., Ltd., and Elektron castings were produced in bulk for companies which included Bristol, de Havilland, Dowty, Napier and A. V. Roe. In the Second World War, when the Coventry factory was damaged by bombing, a new one was opened at Nuneaton; production scarcely had to halt, and it was stated in 1945 that during the war Sterling Metals and associated companies supplied 95 per cent of the total requirement of landing wheels for British aircraft. Since the war, with the development of gas turbine engines, Sterling have specialized in making the type of high-quality castings required in such units, and claim to have pioneered the application of magnesium-zirconium-thorium alloys in this field.

Neoprene forms the plastic surface of the nose radome of the Vickers-Armstrongs Valiant. Components in this material, and in others used extensively by the aircraft industry, are being shown by Imperial Chemical Industries (and their subsidiary Marston Excelsior, Ltd.) at the British Plastics Exhibition, now nearing its conclusion at Olympia.

IN BRIEF

Sir John Maud, Secretary of the Ministry of Power, presented prizes and certificates to some 350 apprentices of the Bristol group of companies at Filton on June 29. Over 1,500 apprentices are at present under training, and with an annual intake of about 400, the total is expected to increase to 2,000 within the next few years.

* * *

Mr. W. A. Hartop, works director of George Kent, Ltd., left recently on a world tour during which he is visiting Kent companies and subsidiaries in Malaya, Australia, New Zealand and Canada.

* * *

R. A. Brand and Co., Ltd., are engaged in Cocooning over a hundred R.C.A.F. Sabres at Prestwick. This contract—being carried out for Scottish Aviation, Ltd., on behalf of the Royal Canadian Air Force—is believed to be the biggest of its kind placed on this side of the Atlantic.

* * *

An order recently placed in this country by the Royal Rhodesian Air Force for a complete G.C.A. system involves three British companies, Standard Telephones and Cables, Ltd. (precision approach radar Type SLA.3 with stand-by units and duplicate console presentation in the control tower); duplicated surveillance radar CR.21 (Cossor Radar and Electronics, Ltd.); and communication equipment (International Aeradio, Ltd.). Standard Telephones and Cables are also responsible for overall planning of the entire G.C.A. installation, while International Aeradio have acted as consultants on the control tower layout.

TWO DAYS AT THE RACES (Continued from page 69)

The Flying Display. Saturday afternoon included a comprehensive flying display as well as the aerobatic championship finals and the King's Cup Race. Hampered by lowish cloud (as were all the jet aerobatic teams), the Royal Navy opened proceedings with a team of five Sea Hawks from No. 738 Sqn., Lossiemouth, led by Lt-Cdr. A. J. Leahy. Their number worried No. 111 Sqn. team, but their show was short. They rolled in box, looped in swan and winged over into arrow before departing. This was their first five-man appearance and, if they can overcome the slight lack of power of the Sea Hawk for this type of flying, they might well worry No. 111 Sqn. again. Five Canberras of No. 9 Sqn., led by W/C. B. P. T. Horsley, put on a fine co-ordinated solo and formation show ending with an excellent bomb-burst. The leader rolled with wing-tanks attached.

Appetites were well whetted now and the Patrouille de France in their Mystère 4s made the most of the relatively narrow space between cloud and ground. After a series of low turning passes in various formations they made a splendid roll from line astern into box and finished with a level bomb-burst and a cross-over. An Edgar Percival E.P.9 was rather distantly shown, and the Super Aero 45 was daintily aerobatted, one propeller being feathered at the top of a loop for a single-engined roll. Krysta gave a fine repeat performance of his winning aerobatic display; and Aresti settled down to some breathtaking flick-rolls off the deck and long, very low inverted passes in his Jungmeister. He had the crowd on its feet several times.

The C.F.S. team in four Provosts, led by F/L. J. H. Kingsbury, put up a superb performance, not only of very close formation aerobatics, but also of fine air drill when arriving and departing. For their show they dived in line astern and looped into box. Their barrel roll was more barrelled than anyone else's and they held their formation rigidly despite very gusty conditions. Their only difficulty was in positioning for a new sequence of manœuvres; they could not fill time with that splendid wing-over which is a necessary part of a jet show. They made a long, slow zoom climb with flaps down and landed in box close to the crowd. Sub-Lt. R. A. Peters, in a Whirlwind of No. 705 Sqn., put up a sprightly and skilful demonstration of picking up and setting down "ditched" airmen in a dinghy, but his show was interrupted by the swarming finish of the King's Cup race. Some competitors threatened his rotor as they rushed past the finishing line. Vic Carr, in a Coventry Gliding Club Olympia, gave a graceful and pleasantly silent aerobatic display from the top of a Tiger aero-tow and landed almost close enough to the towing car to hook up without further moving.

The Valiant is a difficult aircraft to demonstrate excitingly, but W/C. L. H. Trent, commander of No. 214 Sqn., did it. He arrived silently and quickly in a glossy white machine, very low down, and pulled up into a very noisy and impressive full-power climb in a steep turn. Repeating this evolution some time later, he climbed straight into cloud and departed.

All morning we had been discussing the relative merits of the Flying Arrows and the Skyblazers aerobatic teams, respectively flying Hunters of No. 111 Sqn. and F-100Cs of the 36th Fighter Day Wing. The Americans had—and used—the spectacular qualities of their machines, and the R.A.F. concentrated on superb formation holding and changing in their Hunter 6s. The latter now boasted smoke, which the Super Sabres were still unable to produce. But the cloud-base limited both teams to a "flat show" and the strong wind carried away the great booms of the American afterburners.

The Skyblazers, led by Capt. W. "Bill" Creach, flew first, arriving over the crowd with a burst of afterburner. They rolled and turned steeply, coming very low and close to the enclosures. Undoubtedly their *pièce de résistance* was the amazing clover leaf, in which the aircraft break slightly apart and roll individually at very low height, their afterburners twinkling viciously as the wing men add power to keep up. Skyblazer formation flying was very close indeed and their aircraft appeared little affected by bumps.

Whatever the Skyblazers achieve in noise and splendour and rigidly precise formation flying, the five Hunters of No. 111 Sqn. achieve in variety of formation and manœuvre. Theirs is a highly skilled show of pure flying at its best, but the average air-show crowd lacks discernment, being impressed in proportion to noise and *panache*. Yet, though they were limited to a flat show, No. 111 Sqn. performed their full repertoire of formation changes and made one brilliant roll from their own card-five formation into box. With two new members in the team they did extremely well; and ended with a horizontal bomb-burst streaming their new smoke under each wing-tip. They departed with the twin smoke trail curling as the aircraft rolled away.

The afternoon's show ended with a valiant attempt by Peter Hillwood (company test pilot) to get airborne in the veteran English Electric Wren. He succeeded finally and flew bravely a few feet off the ground at an incredibly low speed. It was a fine effort in that gusty wind.

THE BRITISH AIR RACING CHAMPIONSHIP

Final Place	Pilot	Aircraft	Round One	Round Two	Round Three	Champ. Points	Champ. Place
Osram Cup							
3	J. E. G. Appleyard	Chilton D.W. 1a	3	1	4	62	8
7	W. H. Bailey	Hawk Trainer 3	6	9	6	36	27
1	F/L H. B. Iles	M.18/2	1	2	1	70	1
7	J. R. Johnston	Hawk Trainer 3	5	8	8	36	26
4	J. N. Somers	Chipmunk	4	4	7	48	20
5	E. Noel Husbands	Proctor 3	7	5	5	44	24
6	R. H. McIntosh	Proctor 3	Rtd.	6	3	38	25
2	P. Blamire	Gemini 1a	2	3	2	64	6
9	F. Dunkerley*	Gemini 1a	N.S.	7	Disqualified	33	30
Kemsley Trophy							
2	A. S. K. Paine	Proctor 1	3	2	2	64	5
4	T. G. Knox	Proctor 3	1	4	7	54	15
1	A. Barker	Proctor 3	2	1	3	66	3
5	E. Crabtree	Gemini 3a	6	8	1	48	17
6	G. Marler	Falcon 6	5	5	6	46	21
9	S/L J. Rush	Falcon 6	8	9	9	26	32
3	R. R. Paine	Hawk Speed 6	4	3	4 tie	55	14
7	P. S. Clifford†	Mew Gull	7	7	8	34	28
8	F. Dunkerley	Sparrowjet	Rtd.	6	4 tie	33	30
—	H. M. Kendall	SK-1	N.S.	—	—	—	—
Goodyear Challenge Trophy							
3	C. Gregory	Taylorcraft Plus D	3	3	4	58	9
2	J. H. Denyer	Auster J.1N	4	1	2	63	7
3	D. Hartas	Tiger Moth	1	6	3	58	11
5	W. P. Maynell	Tiger Moth	6	4	5	48	19
6	D. F. Ogilvy	Hawk Trainer 3	5	5	6	46	22
1	W. P. Bowles‡	Monarch	2	1	1	69	2
7	J. Heaton	Jackaroo	8	7	7	34	29
9	J. Hill	Tipsy B	7	8	—	20	35
8	Cdr. W. Stuart	Jackaroo	9	9	8	26	34
"News Chronicle" Trophy							
7	J. M. Donald	Tiger Moth	6	6 tie	4	45	23
8	Miss M. McKellar	Tiger Moth	8	8	9	28	31
9	Miss A. A. Windle	Tiger Moth	9	9	8	26	33
1	Hon. P. Vanneck	Tiger Moth	4	1	2	64	4
5	N. H. Jones	Tiger Moth	7	6 tie	1	49	16
—	N. D. Norman	Tiger Moth	N.S.	—	—	—	—
4	A. G. Oldham	Tiger Moth	2	3	6	56	13
6	J. Harris	Tiger Moth	3	5	7	48	18
2	J. Pothecary	Tiger Moth	5	2	3	58	12
3	D. W. Phillips	Tiger Moth	1	4	5	58	10

*Air League Challenge Cup for the best time (153.75 m.p.h.) in Class 1. †Norton Griffiths Challenge Trophy for the best time (200.75 m.p.h.) in Class 2. ‡Grosvenor Challenge Cup for the best time (131.5 m.p.h.) in Class 3.

THE KING'S CUP

Pilot	Aircraft	H'cap m.	H'cap s.	Speed m.p.h.	Place
F. Dunkerley*	Sparrowjet	38	29	228	1
S/L J. Rush	Falcon 6	31	04	172.75	2
W. P. Bowles	Monarch	21	00	137.75	3
P. S. Clifford	Mew Gull	39	14	215.5	4
J. R. Johnston	Hawk Trainer 3	23	38	144.25	5
E. Crabtree	Gemini 3a	29	53	165.5	6
N. H. Jones	Tiger Moth	12	50	117.25	7
F/L H. B. Iles	Miles M.18/2	22	38	140.75	8
C. Gregory	Taylorcraft Plus D	12	08	115.75	9
T. G. Knox	Proctor 3	26	49	153.5	10
Hon. P. Vanneck	Tiger Moth	09	14	110	11
J. Heaton	Jackaroo	04	11	101.75	12
G. Marler	Falcon 6	32	23	173.75	13
J. E. G. Appleyard	Chilton D.W. 1a	24	18	144.25	14
R. R. Paine	Hawk Speed 6	35	52	191	15
D. W. Phillips	Tiger Moth	09	46	110.5	16
J. H. Denyer	Auster J1N	18	07	127.5	17
A. G. Oldham	Tiger Moth	08	28	108	18
A. S. K. Paine	Proctor 3	28	17	156.75	19
P. Blamire	Gemini 1a	26	06	148.75	20
E. Noel Husbands	Proctor 1	26	23	149	21
Miss A. Windle	Tiger Moth	08	08	107	22
D. Hartas	Tiger Moth	10	46	111	23
Cdr. W. Stuart	Jackaroo	03	30	99.25	24
Miss M. McKellar	Tiger Moth	10	37	110.5	25
J. Pothecary	Tiger Moth	07	32	105.5	26
J. Harris	Tiger Moth	07	32	105.5	27
A. Barker	Proctor 3	28	07	152.75	28
W. H. Bailey	Hawk Trainer	15	55	120	29
J. M. Donald	Tiger Moth	07	16	103.75	30
W. P. Maynell	Tiger Moth	06	41	102	31
D. F. Ogilvy	Hawk Trainer	15	55	117.75	32
W/C R. H. McIntosh	Proctor 3	25	23	134.75	33
J. Hill	Tipsy B	00	00	89	34
J. N. Somers†	Chipmunk	24	55	Retired	

*Winner of the S.B.A.C. Cup for the best time.
†Forced-landed after losing a propellor near Market Harborough.

DESOUTTER improves even on perfect tightness..!

It's PNEU ! It's the PNEU pneumatic lightning tightener . . .
Desoutter's amazing PNEU Multiple Nut Runner—
the P.M.N.R. It screws up not one nut . . . not two nuts . . . not
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Lug that job off the assembly line
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Desoutter turns *tightest of all !*

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We thought we'd better ask the M.D.
what he thought of our new-style
advertising. "I don't quite understand,"
he smugged. "It sounds as if we're
trying to *sell* Desoutter tools."
As if he never did !

With acknowledgments to the makers of
Omo, Daz, Surf, Persil, Tide, Dreft, Fab, Cheer
and all others of that inimitable school.

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FAIREY'S widespread activities offer numerous opportunities for soundly-qualified men with the right training or experience. If you are confident that you have the qualifications and keenness to join the team that, among other achievements, produced FIREFLASH, Britain's first production guided weapon, write to the address below: give your full details, including your own preference for the more specialised types of work.

Vacancies exist for Aerodynamicists · Physicists · Electronic Engineers · Instrument Design Engineers · Mechanical Test Engineers Stressmen · Graduates (in Engineering or Science) · Draughtsmen (Electronic, Jig and Tool, Mechanical Design and Detail).

The illustration shows functional testing of a FIREFLASH Guided Weapon in the Laboratories — one aspect only of the interesting and varied work awaiting you at Fairey Aviation.

THE FAIREY AVIATION COMPANY LTD

Weapon Division

CRANFORD LANE · HESTON · NR. HOUNSLOW · MIDDX.

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EASTERN PROVINCIAL AIRWAYS LIMITED

GANDER · NEWFOUNDLAND · CANADA

One HELICOPTER PILOT with at least 1,000 hours bush experience or the equivalent. Type of helicopter: Bell 47 J.
Starting Salary: $800.00 (equivalent approx. £302) per month.

One Licensed HELICOPTER ENGINEER.
Starting Salary: $400.00 (equivalent approx. £151) per month.

One or more Licensed AIRCRAFT ENGINEERS for Fixed Wing Aircraft including Beavers, Otters, Canso, etc.
Starting Salary: $350.00 (equivalent approx. £132) per month.

All Engineers required to have 5 years' experience in Aircraft Industry.

Interested parties reply to the undermentioned for full particulars:

MR. ANDREW CROSBIE
HOLMWOODS & BACK & MANSON LIMITED
85 GRACECHURCH STREET, LONDON, E.C.3
Telephone: Mansion House 4471-7

ENGLISH ELECTRIC AIRCRAFT

FLIGHT TEST and INSTRUMENTATION

The Aircraft Division has an extensive programme of flight testing on a large number of pre-production P.1B supersonic fighters, in addition to the flight testing of the prototypes, and applications from flight test and instrumentation engineers are required for this expanding department. It is emphasised that with the production order recently placed for the P.1B, continuity of employment is assured.

FLIGHT TEST ENGINEERS should have H.N.C., a degree or higher qualifications and preferably some years experience in this type of work.

INSTRUMENTATION ENGINEERS should have O.N.C. or better and some years experience in instrumentation techniques or similar work. The laboratory is fully equipped and modern techniques of instrumentation are employed.

The Division is located at Warton Aerodrome near the pleasant residential area of Lytham St. Annes, and interested applicants should write with full details to

Dept. C.P.S., Marconi House, 336/7 Strand, W.C.2, quoting reference F 1712D.

FLIGHT and AIRCRAFT ENGINEER

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CLASSIFIED ADVERTISEMENTS

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Postal Orders and cheques sent in payment for advertisements should be made payable to Iliffe & Sons, Ltd., and crossed & Co.

Trade Advertisers who use these columns regularly are allowed a discount of 5% for 13, 10% for 26 and 15% for 52 consecutive insertion orders. Full particulars will be sent on application.

Box Numbers. For the convenience of private advertisers, Box Number facilities are available at an additional charge for 2 words plus 1/- extra to defray the cost of registration and postage, which must be added to the advertisement charge. Replies should be addressed to "Box 0000, c/o Flight," Dorset House, Stamford Street, London, S.E.1.

The Publishers retain the right to refuse or withdraw advertisements at their discretion and do not accept liability for delay in publication or for clerical or printer's errors although every care is taken to avoid mistakes.

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Aircraft and Engine Overhaul
Sales — Service — Tuition
Scheduled and Charter Operators
DERBY AIRPORT
Telephone: ET WALL 321

For Immediate Sale
we offer
A WIDE VARIETY OF AIRCRAFT TYPES
ranging from Autocrats to a Mosquito B 35 including
a Gemini 1A (with Cirrus Minor 2as)
and
a Gemini 3A (with Gipsy Major 10/2s)
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Our fleet of helicopters is at your disposal anywhere in the world, any time.
We also run a training school for pilots and engineers on Bell 47 and Sikorsky S55 helicopters. Ask for further details from:
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EUROPE'S LARGEST AIRCRAFT BROKERS
OVER 25 YEARS AT 175 PICCADILLY
138 DIFFERENT TYPES OF AIRCRAFT SOLD

FOR many years we have been honoured by world-famous airlines, great industrial organisations, large and small firms and many clubs and private owners with instructions to sell their aircraft.

IN most cases we have been granted the sole selling rights.

WE ARE PROUD AND GRATEFUL FOR THE CONFIDENCE THAT HAS BEEN PLACED IN US

IN the past three months we have sold five Vickers Vikings. They were VP-YHJ owned by Central African Airways and VP-TAT, VP-TAU, VP-TAV and VP-TAW owned by British West Indian Airways. West African Airways in conjuction with B.O.A.C. gave us the sole selling rights of the their fleet of six Handley Page Marathons and three D.H. Doves. All nine aircraft were quickly disposed of, together with the big inventory of engines and spare parts.

AER LINGUS kindly invited us to sell their splendid fleet of four Bristol 170 type 31E Wayfarers backed by great stocks of power plants, spare parts, tools and handling equipment. They gave us the sole selling rights. Everything down to the last nut and bolt has been sold, and the four aircraft are now hard at work in the Middle East, New Zealand, France and the Channel Islands.

THE SHELL PETROLEUM COMPANY flew in a small fleet of Percival Princes from Venezuela and Borneo and entrusted their sale to us. They were quickly sold as also were other Princes owned by The Standard Motor Company and A. D. J. Ashpool, Ltd.

B.O.A.C., AIRWORK LTD., Independent Air Travel Ltd., Eagle Aviation, East African Airways, Scottish Airlines, and many other famous operating companies, firms and private owners have given us Vikings, Dakotas, Herons, Doves and smaller 'planes to sell. They have not been disappointed in us!

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HAVE just taken into stock:

AUSTER 5 J.1. Autocrat, G-AHCO.

AUSTER 5, G-ANIF, newly upholstered.

BOTH in excellent condition, with dual controls, etc. Available for inspection at Yeadon Airfield, Leeds, and for which offers are invited.

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AVRO XIXs G-AGNF and G-AGZT at Croydon with low- and nil-hour Cheetah engines. Current or 12 months C. of A., 8-10 passengers, from £3,950.

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AVRO Anson Mark I, OY-ADB, at Derby, with 216 and 261 hours on Cheetah engines. No British C. of A. obtainable, but in first-class condition. Only 532 total hours on airframe, metal tail-plane. £1,500.

WE have, of course, many other aircraft available.

R. K. DUNDAS, LTD., 59, St. James's Street, London, S.W.1. Tel.: HYDe Park 3717. Cables: "Dundasaero," Piccy, London. [0559

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FLYING HELMET
No. 103
35/-

Leather Flying Helmet for the Club Flyer. Suitable for use with flat type Gosport Tubes. C/No. 214.
Weight 8 ozs. Brown only. Sizes 6½ in. to 7½ in.
★ Gosport tube C/No. 214 **22/6.**
★ Helmets complete with Gosport Tubes **55/-** per set.

EX-R.A.F. SUITS, SUMMER FLYING Part used (Personal Shoppers only) **39/6**
R.A.F. ANTI-GLARE SUN SPECTACLES
Complete with strong case, **22/6** post free.

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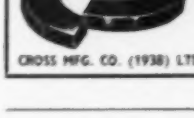

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FAIREY'S widespread activities offer numerous opportunities for soundly-qualified men with the right training or experience. If you are confident that you have the qualifications and keenness to join the team that, among other achievements, produced FIREFLASH, Britain's first production guided weapon, write to the address below: give your full details, including your own preference for the more specialised types of work.

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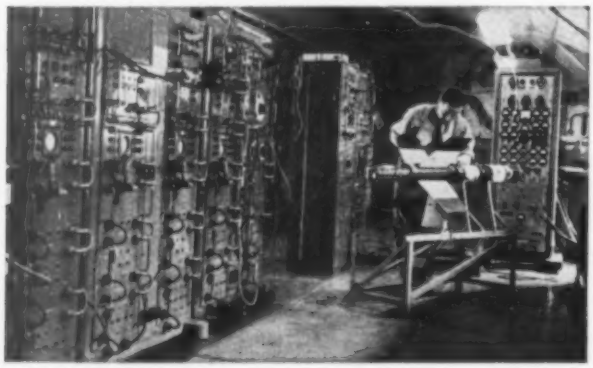

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Weapon Division

CRANFORD LANE · HESTON · NR. HOUNSLOW · MIDDX.

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GANDER · NEWFOUNDLAND · CANADA

One HELICOPTER PILOT with at least 1,000 hours bush experience or the equivalent. Type of helicopter: Bell 47 J.
Starting Salary: $800.00 (equivalent approx. £302) per month.

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DERBY AIRPORT
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A WIDE VARIETY OF AIRCRAFT TYPES
ranging from Autocrats to a Mosquito B 35 including
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OVER 25 YEARS AT 175 PICCADILLY
138 DIFFERENT TYPES OF AIRCRAFT SOLD

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IN most cases we have been granted the sole selling rights.

WE ARE PROUD AND GRATEFUL FOR THE CONFIDENCE THAT HAS BEEN PLACED IN US

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B.O.A.C., AIRWORK LTD., Independent Air Travel Ltd., Eagle Aviation, East African Airways, Scottish Airlines, and many other famous operating companies, firms and private owners have given us Vikings, Dakotas, Herons, Doves and smaller 'planes to sell. They have not been disappointed in us!

ANYTHING FROM A B.A. SWALLOW TO A BRITANNIA!

WE have actually in stock Aiglet Trainer, Messenger, Auster Alpha, Chipmunk and Bristol Freighter Mark 21 aircraft.

WE SOLD 68 CHIPMUNKS LAST YEAR!

W. S. SHACKLETON, LTD., 175, Piccadilly, London, W.1. Cable: "Shackhud, London." Tel.: HYDe Park 2448-9. [0070

R. K. DUNDAS, LTD.

HAVE just taken into stock:

AUSTER 5 J.1. Autocrat, G-AHCO.

AUSTER 5, G-ANIF, newly upholstered.

BOTH in excellent condition, with dual controls, etc. Available for inspection at Yeadon Airfield, Leeds, and for which offers are invited.

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WE have, of course, many other aircraft available.

R. K. DUNDAS, LTD., 59, St. James's Street, London, S.W.1. Tel.: HYDe Park 3717. Cables: "Dundasaero," Piccy, London. [0559

★ FOR THE CLUB FLYER ★

FLYING HELMET
No. 103
35/-

Leather Flying Helmet for the Club Flyer. Suitable for use with flat type Gosport Tubes. C/No. 214.
Weight 8 ozs. Brown only. Sizes 6½ in. to 7½ in.
★ Gosport tube C/No. 214 **22/6.**
★ Helmets complete with Gosport Tubes **55/-** per set.

EX-R.A.F. SUITS, SUMMER FLYING Part used (*Personal Shoppers only*) **39/6**
R.A.F. ANTI-GLARE SUN SPECTACLES Complete with strong case, **22/6** post free.

Terms to Flying Clubs. *Illustrated leaflet on request. Trade supplied.*

Lewis LIMITED
(Dept. F), 124 Great Portland St., London, W.1.
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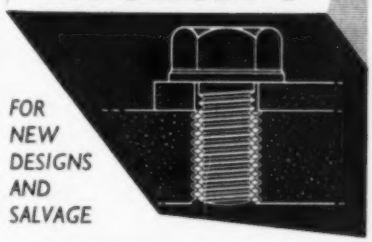

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APPLICATION form and further particulars from Civil Service Commission, Scientific Branch, 30, Old Burlington Street, London, W.1, quoting S 128/57 and stating date of birth.

INTERVIEW Boards will sit at intervals, as required. Early application is advised. [6849

PUBLIC ANNOUNCEMENTS

AIR TRANSPORT ADVISORY COUNCIL

THE AIR TRANSPORT ADVISORY COUNCIL give notice that they have received the undermentioned applications to operate scheduled air services:—

APLICATION No. 1300 from British European Airways Corporation of Keyline House, Ruislip, Middlesex, for permission to combine at their discretion the Normal Scheduled Services on the routes set out as Routes Nos. 7 and 24 in Schedule 'A,' Part II, of the Terms of Reference, so as to operate on the route London-Munich and/or Vienna.

APPLICATION No. 339/3. From British Overseas Airways Corporation, of London Airport, Hounslow, Middlesex, for an amendment to the terms of the Normal Scheduled Service which the Corporation have been authorised to operate on the route London-Frankfurt or Zurich-Rome-Nicosia or Beirut or Cairo-Baghdad (optional)-Abadan and/or Karachi, so as to include Kuwait, Bahrain and Damascus as optional traffic stops.

APPLICATION No. 1301. From Starways, Ltd., of Liverpool Airport, Liverpool 19, for a seasonal Normal Scheduled Service with Dakota aircraft and later with DC4 aircraft for the carriage of passengers between Liverpool (Speke) and Bilbao at a frequency of two return flights per week increasing according to traffic demand during the season from May to October inclusive each year, for a period of seven years, commencing May 1958.

FROM Eagle Airways, Ltd., of 40 Edgware Road, London, W.2:—

APPLICATION No. 160/3 for an amendment to the terms of approval of the All Freight Service which they are authorised to operate on the route Manchester and/or Birmingham-Dusseldorf or Frankfurt and/or Berlin-Copenhagen-Stavanger and/or Oslo-Stockholm and/or Gothenburg-Copenhagen-Berlin and/or Dusseldorf or Frankfurt-Birmingham and/or Manchester, until 31st August, 1960, so as to permit them to operate with Viscount aircraft in addition to the aircraft types already authorised for the remaining period of approval.

APPLICATION No. 953/1 for an amendment to the terms of approval of the Normal Scheduled Service which they are authorised to operate on the route Manchester (Ringway)-Ostend until 19th June, 1963, so as to enable them to operate with Viscount aircraft in addition to Dakota aircraft for the remaining period of approval.

THESE applications will be considered by the Council under the Terms of Reference issued to them by the Minister of Civil Aviation on 30th July, 1952. Any representations or objections with regard to these applications must be made in writing stating the reasons and must reach the Council within 14 days of the date of this advertisement, addressed to the Secretary, Air Transport Advisory Council, 3, Dean's Yard, London, S.W.1, from whom further details of the applications may be obtained. When an objection is made to an application by another air transport company on the grounds that they are applying to operate the route or part of route in question, their application, if not already submitted to the Council, should reach them within the period allowed for the making of representations or objections. [6856

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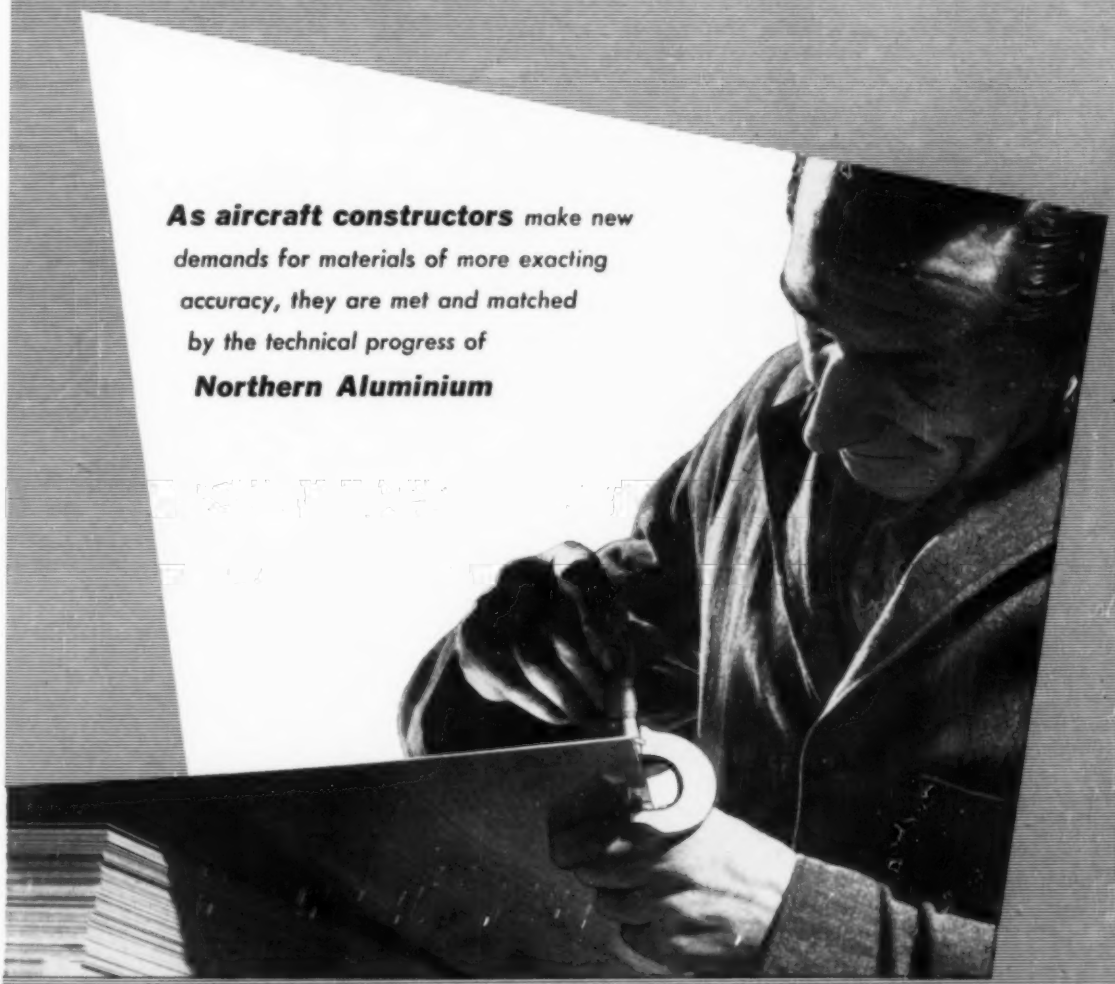

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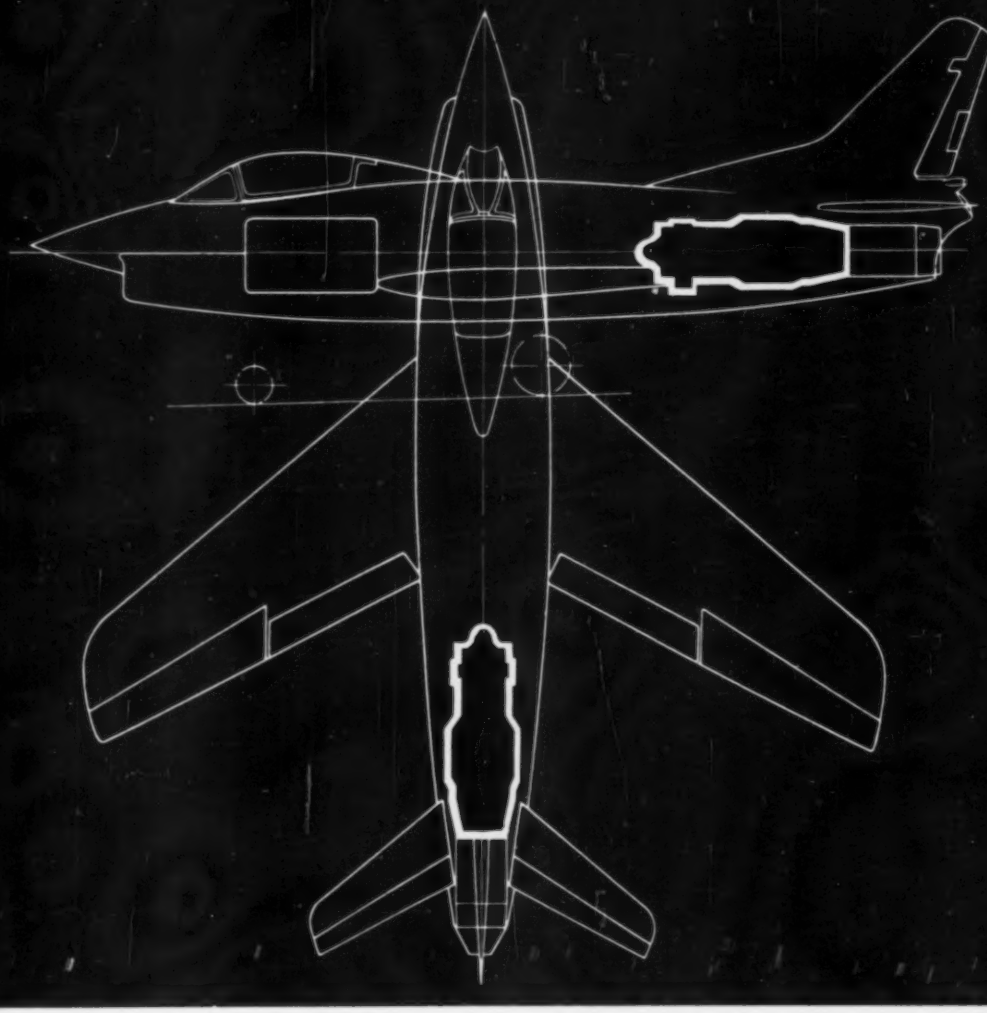

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